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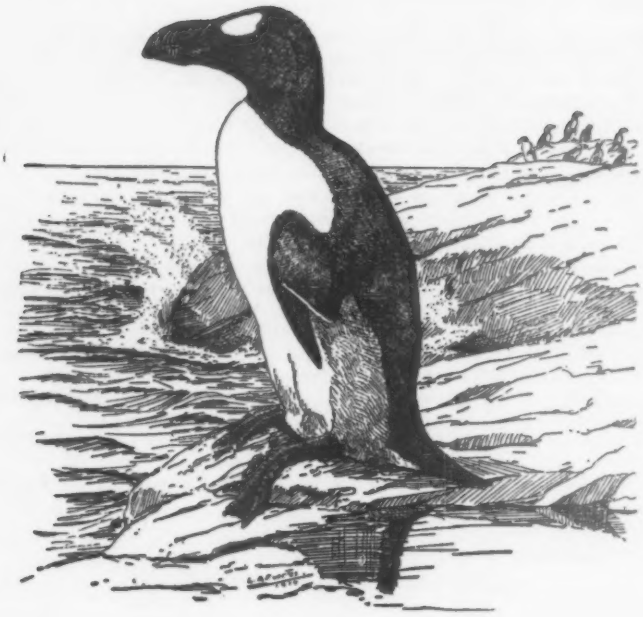

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AN APPROACH TO THE STUDY OF MOLTS AND PLUMAGES

BY PHILIP S. HUMPHREY AND KENNETH C. PARKES

1. INTRODUCTION

During the course of studies of the molts and plumages of certain waterfowl and other birds, it has become apparent to us, as it has to a number of other workers, that the description of plumage successions has often been hampered by the lack of a uniform and practical terminology. It was our original intent to introduce a new terminology applicable, as far as possible, to all birds, in order to eliminate some of the semantic difficulties of the past. As this project progressed, it became obvious that knowledge of the plumage stages of many species is sadly incomplete or poorly understood; further study revealed the need of a reexamination of many long-held concepts of plumage succession and of more precise definitions of widely but ambiguously used terms. The subject is too large to be covered in a single paper. We propose here to discuss plumage succession beginning at the time of loss of the juvenal plumage, i.e., the bird's first covering of true (in some cases modified) contour feathers. We hope in a later paper to analyze the development of the plumages from the embryo through the completed juvenal plumage. We have adopted this reversed chronological sequence because of the complexity of the question of the "natal downs" and their origin, which we intend to investigate at some length.

We hope in this paper to throw new light on concepts of plumage and molt, and we present a framework within which descriptive and comparative studies may be made. In spite of the vast progress made by many workers in recent decades in understanding some of the factors which affect the physiology of molt (genetic control, hormonal balance, photoperiod, temperature, diet, etc.), it must be remembered that such information is available for but a small fraction of the species of birds of the world. We believe it is greatly desirable to have

a system available whereby variations in the patterns of plumage succession may be described, compared, and contrasted among different groups of birds, whether or not the physiological mechanisms have been worked out for the groups in question.

In reviewing the recent literature in which intrinsic and extrinsic factors affecting molt have been discussed, it has become apparent that such factors may vary widely in relative importance among different groups of birds. In striking contrast to this heterogeneity is what appears to be a fundamental pattern of plumage succession which can be traced almost throughout the class Aves. Such a pattern has been noted and utilized by students of this subject for over a century. The prevalence of this apparently consistent pattern leads us to believe that a broad concept of homology, such as that advocated by Hubbs (1944), may usefully be applied to plumages and molts, and that descriptive and comparative plumage studies will proceed in a more orderly fashion if they are conducted in the light of such a homology concept. It is, of course, impossible to be certain that plumage sequences which appear to be exactly equivalent in various groups of birds are truly homologous in the phylogenetic sense; however, we believe it is not only useful but even necessary to treat such equivalence provisionally as homology in studies of the type we have mentioned.

A few groups of birds present exceptionally difficult problems of interpretation when attempts are made to fit them into the system of homologies here proposed. Further study of some of these difficult groups, which will be mentioned later, may ultimately prove them to be real exceptions to the general pattern, with sequences of plumage succession which have evolved independently. On the other hand, their apparent nonconformity may someday be resolved and their sequence of plumage succession shown to be merely extreme modifications of the general pattern.

Various drafts of the manuscript have been read entirely or in part by many of our colleagues; we are grateful for their comments and helpful suggestions. We wish particularly to acknowledge the constructive criticism given us by Ralph S. Palmer, Thomas R. Howell, Finn Salomonsen, Eugene Eisenmann, and Charles H. Blake.

2. DEFINITIONS

Any description of the plumage succession of a species depends ultimately on the way in which the terms "plumage" and "molt" are defined. Ambiguous use of such words makes it difficult to arrive at straightforward interpretations for any one species, and virtually impossible to trace homologies.

(1) *Cycle.* In most birds of temperate regions, which are the best known, there are several cyclic phenomena which coincide with the

calendar year: reproduction, migration, molting, etc. It is convenient, for such birds, to speak of "number of plumages *per year.*" But there is increasing evidence that some equatorial, antarctic, and oceanic species may have reproductive cycles of less or more than a calendar year, viz., the 9.6-month nesting cycle of Ascension Island Sooty Terns *(Sterna fuscata)* (Chapin, 1954), and the 14- to 18-month breeding cycle of South Georgia King Penguins *(Aptenodytes patagonica)* (Stonehouse, 1956). Although little is yet known on this point, the cycles of plumage succession in such species may also be of more or less than a year. Since our aim in this paper is to suggest homologies of plumages (and a resultant nomenclature) applicable to birds of any part of the world, we will be, for the most part, using the expression "per cycle" rather than "per year." "Cycle" in this sense is to be understood as a shortened version of "plumage cycle;" a "cycle" (in an adult bird) runs from a given plumage or molt to the next occurrence of the same plumage or molt.

(2) *Plumage.* This is much more difficult to define than it would first appear. Dwight (1900) differentiated between "winter" and "nuptial" plumages, even when no molt intervenes, in order to describe those birds which change their appearance markedly through wear. But he even extended this two-plumage concept to birds which do not change their appearance at all (*cf.* the two "plumages" of *Progne subis,* Dwight, 1900: 225). This concept of individually-named plumages attained by either molt *or* wear is probably not widely accepted at present. If followed to its logical conclusion, it would be necessary to state that the adult male Bobolink *(Dolichonyx oryzivorus)* has *three* plumages: the "winter," which is lost by a complete molt, the "spring," and the "summer," attained through wear.

Another type of plumage definition based on the over-all appearance of the bird involves those species in which a molt may be greatly protracted or even temporarily suspended; that is, virtually divided into two stages by a pause in the process of feather replacement. The temptation is then to give separate plumage names based on the appearance of the two stages of the molting bird. As Mrs. Stresemann (1948: 190) puts it, "The resumption of feather growth after a period of interrupted moult does not mean at all that a new plumage is assumed. . . . Many of the Palaearctic migrants, for example, divide their principal moult into two periods. They moult part of their plumage (usually the entire body plumage) before migration, while the remainder of the plumage (usually wing and tail feathers) is not moulted until several weeks later in the winter quarters (as in *Hirundo, Delichon,* and *Riparia*)." This is also true of certain Nearctic migrants, for example many Tyrannidae.

For purposes of homology we feel that it is necessary to confine the word "plumage," as used in studies of plumage succession, to

a single generation of feathers. Such a generation may include less than the entire feather covering of a bird; thus the feathers attained by a partial molt constitute in themselves a plumage by this definition. Perhaps the most important point to stress here is that by our definition the number of plumages is equal to the number of molts in a given cycle. Salomonsen (1941, 1949) described and named no less than four "plumages" for the Oldsquaw *(Clangula),* although admitting that no feather is renewed more than three times per cycle, and most feathers only once or twice. According to our concept, the plumages of the Oldsquaw are homologous with those of other ducks, *except* for the fact that an additional generation of feathers, including only the scapulars and parts of the head, occurs during each cycle. These few feathers constitute the only additional "plumage" of the Oldsquaw, all others being homologous not only with the plumages of other ducks but of other birds in general.

The traditional concept by which a bird can wear only one "plumage" at any given time, the "plumage" being described in terms of the bird's *appearance* rather than of the particular generations of feathers producing this appearance, makes the determination of plumage homologies difficult if not impossible. In birds with greatly protracted molts the appearance may be changing continually, and subdivision into "plumages" on the appearance basis must be, to say the least, arbitrary.

Several authors, including Dwight and Meylan (1932) have used the term "compound plumage." By their definition, a bird wears a "simple plumage" following a complete molt, and a "compound plumage" after a partial molt. By our definition, this is impossible; after a partial molt the bird wears the newly assumed plumage plus parts of one or more previous plumages rather than a single "compound" plumage.

The various semantic difficulties outlined above arise, we feel, out of a real need for additional terms. If a bird at a given time may, according to our usage, be wearing feathers belonging to two or more plumages, how may the bird best be described at that moment? To aid in resolving these difficulties, two additional terms appear to be necessary, as follows:

(3) *Aspect.* This word may be used in descriptions of the total *appearance* of a bird at any given time, no matter how many generations of feathers combine to produce that appearance. Aspect also takes into account changes in appearance brought about by adventitious factors such as fading, staining, and abrasion (wear). In field guides or other simplified descriptions, it will be possible to describe

and portray the "spring aspect" or "winter aspect" of a given species, without reference to plumage names or to actual stage of molt. Thus, a frequently seen late summer aspect of young Starlings *(Sturnus vulgaris)* consists of a grayish-brown head, white-spangled black body, and blackish wings and tail. A given aspect may be analyzed in as much detail as seems desirable.

It is thus apparent that Salomonsen (1941, 1949) has divided various stages of the three plumages of the Oldsquaw into four aspects, which he has designated as "plumages."

(4) *Feather coat.* This term may conveniently be used when it is desirable to describe the aggregate of feathers worn by a bird regardless of the relative time of assumption of the components of that aggregate. The feather coat may, at any given moment, consist of feathers of one, two, or more plumages, i.e., generations of feathers. Descriptions of the feather coat may be made whether or not a molt is under way at the time. Thus, the feather coat of young Starlings during a frequently observed stage of molt in late summer comprises head feathers of the juvenal plumage and body and flight feathers of the next succeeding plumage.

Enumeration of the components of the feather coat actually represents an analysis, in part, of the elements which produce a given aspect (although adventitious factors are irrelevant in describing a feather coat). It should be pointed out that the *aspect* of an individual living bird or specimen can be described even though the plumage sequence of its species is not well enough understood to permit analysis of the components of its *feather coat.*

When, later in the present paper, it is necessary to refer to "plumage" in Dwight's sense (a combination of our concepts of feather coat, aspect, and plumage), the word will be enclosed in quotation marks to distinguish it from the term as we use it in a restricted sense.

A few of our colleagues, on reading this paper in manuscript, have felt that we have given an unduly restricted definition to the word *plumage* by limiting its use in technical discussions of plumage sequence to a single generation of feathers. As has been shown, the word "plumage" as formerly used is a vaguely-defined combination of three different concepts. We feel that it is desirable to continue to use the word *plumage* for one of these three concepts rather than to abandon the word and introduce three new terms; a technical discussion of the molts of a bird without any use at all of the word *plumage* is almost unthinkable. Even though, as used in such expressions as "juvenal plumage", "first winter plumage", etc., in the past, the word "plumage" does not always conform to our restricted definition, we feel that this word carries an established implication of a *stage in a sequence.* It seems logical, therefore, to choose a restricted definition of *plumage* as we have done in order to be able to continue using the word in

technical discussions of the sequential phenomenon of feather replacements. As so used, there can hardly be confusion with the broadly descriptive use of the word *plumage* as in such expressions as "brightly-plumaged birds," "lax plumage," "worn plumage," etc.

(5) *Molt.* A molt may be defined as the normal *shedding of feathers and the replacement of most or all of these by a new generation of feathers.* This definition holds no matter how few feathers are involved and regardless of the time required for this process. The feathers which are shed during a given molt may belong to a single generation or may include feathers, belonging to earlier generations, which have survived one or more previous molts.

The definition of molt given above includes two distinct phenomena: The shedding of feathers and the growth of new feathers. The loss of feathers during normal molting has relatively little physiological impact on the organism. The development of a generation of new feathers, on the other hand, is profoundly interrelated with other physiological processes, affecting some and being affected by others.

Some authors have sought to restrict the term "molt" to the loss alone, using an additional term for the subsequent growth of new feathers. This is an unnecessary and erroneous restriction; the word "molt" is derived from the Latin *mutare,* "change", implying the substitution of the new for the old.

There is evidence (Staebler, 1941) that some birds of northern latitudes have evolved a mechanism whereby more individual body feathers are worn in winter than in summer, presumably by losing feathers from certain follicles in the spring and not replacing these until the autumn. There are several ways in which this adaptation may have developed. Elaboration on this topic would be peripheral to the present paper, but it should be stated that such adaptations can be interpreted within the framework of the concepts here presented.

In birds which renew all their feathers only once per cycle, the process of feather replacement may occur (1) through all or most of the year as a protracted molt, (2) during a relatively brief period at a particular time of year, such as just after nesting, or (3) in several, temporally isolated periods; thus, part of the molt might occur during a brief period in the summer and another part after the bird had reached the wintering ground. In other words, a single molt may be temporally extended or compressed, continuous or discontinuous. In addition, the temporal position of a particular molt may be shifted so that it may commence immediately upon the

completion of the prior molt, or, in certain groups, even before completion of the prior molt. The best known example of such overlapping molts occurs in certain ducks. The molting of the remiges in these ducks has been widely accepted as the last portion of the molt into the "eclipse plumage." Before the growth of the remiges is completed, the next molt is initiated; see description of a specimen of Velvet Scoter *(Melanitta fusca)* in Witherby *et al.* (1943, vol. 3: 355).

We use "partial" and "complete" in their traditional senses; the latter for the assumption of a generation of feathers by the renewal of all tracts, the former for the assumption of a generation involving only specific portions of the bird's covering of feathers. Most adult birds have at least one complete molt per cycle; many have one complete and one partial molt. Some adult birds acquire two different plumages by two complete molts per cycle. Adults of a very small number of species have one complete and two or three partial molts per cycle. Thus, any given feather follicle may be activated once, twice, or rarely three or four times per cycle.

An additional point on usage may be mentioned here. For reasons of clarity, we prefer in general to confine the noun "molt" to the entire change between plumages, and when dealing with an individual feather or group of feathers (but less than an entire generation), to use the present participle, thus: (a) this species undergoes a partial *molt;* (b) the *molting* (not "molt") of the rectrices is centrifugal.

In summary, it may be said

1) A molt consists of the normal shedding of feathers and the replacement of most or all of these by a new generation of feathers, a process which occurs periodically in more or less definite relationship to other events in the life history of an individual bird. This excludes accidental loss and replacement of feathers.

2) Within a single cycle of plumage succession, feathers of various tracts may be renewed once, twice, or (rarely) three or four times.

3) A bird can have no more molts in a single cycle of plumage succession than the maximum number of times any feather follicle is activated.

4) Within a cycle, a molt may be protracted or compressed in time.

5) A molt may be continuous, limited in time, or interrupted in time.

6) The temporal position of a homologous molt in the cycles of plumage succession may vary among different groups of birds or among individuals of a species.

7) A molt may commence immediately upon (or in certain groups even before) completion of the prior molt.

8) The characteristics of a molt may vary with the age, sex, or geographic origin of an individual, and may be influenced by environmental factors.

3. CURRENTLY ACCEPTED CONCEPTS OF PLUMAGE SUCCESSION

Although several authors, including Mayaud, A. H. Miller, Pitelka, Portmann, Salomonsen, Schiøler, Stresemann, Sutton, Witherby, and others, have published papers on specific problems involving molts and plumages, there has been no recent general paper on the subject. Current practices with regard to naming molts and plumages, and the works of Dwight and Meylan, indicate rather clearly the nature of the assumptions underlying currently accepted concepts of plumage succession.

The so-called "nuptial plumage," according to presently accepted views, is common to all "adult" birds, as is the "postnuptial" molt. Plumage equivalences of the sort to which we have applied the homology concept have been established largely in relation to the postnuptial molt. In the words of Dwight (1900: 130): "The only invariable moult is the postnuptial, which, except in a very rare few cases, is absolutely complete and takes place in all species at the close of or soon after the breeding season peculiar to each." Since the postnuptial molt takes its name from the "plumage" preceding it, it is obvious that either the molt or the "plumage" or both may be used as landmarks of homology.

A fundamental assumption, with which we concur, is that most normal adult birds have at least one complete molt per cycle; the molting of any feather which is normally renewed only once per cycle is thus part of this molt no matter when it occurs. This molt (usually called the "post-nuptial" or "complete annual") *and* the "plumage" preceding it have been generally assumed to be equivalent in most birds.

Correlation with the reproductive cycle has also been used in attempting to determine equivalence of plumages, as implied by the last portion of the passage quoted from Dwight, above. Birds with but a single plumage and one molt per year must obviously be wearing their "nuptial plumage" the year round. Many birds have, in one or both sexes, two plumages per year, one of which is a bright "nuptial plumage" usually correlated with reproductive behavior and lost by a complete molt, and the other a dull "non-nuptial plumage" which is partially lost during the partial "prenuptial" molt.

The "reproductive plumages" worn by adult birds, whether they have an additional "non-nuptial plumage" or not, have been con-

sidered equivalent, particularly in view of the fact that these "reproductive plumages" are almost always lost by a complete molt. This relationship constitutes the fundamental basis of what might be called current concepts of plumage homologies. The various so-called "immature plumages" are interpreted by working backwards from the first postnuptial (complete) molt as a landmark and counting the "plumages" (usually two or three) between it and the "natal plumage."

On the basis, then, of current concepts of plumage homologies as outlined above, the plumages of an adult bird with one plumage per cycle (example, the Starling) and an adult bird with two "plumages" per cycle (example, the Scarlet Tanager, *Piranga olivacea*) may be diagrammed as in Figure 1.

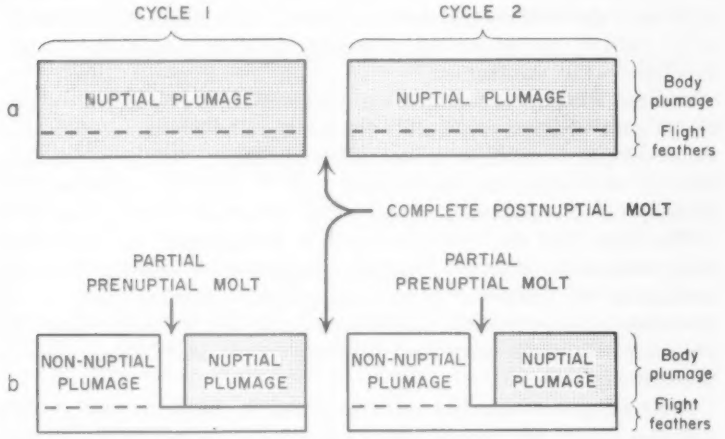

FIGURE 1. Schematic presentation of traditional concept of sequence of molts and plumages in mature individuals of (a) Starling *(Sturnus vulgaris)* and (b) Scarlet Tanager *(Piranga olivacea)*. In these two species one cycle corresponds to one year; two cycles (two years in this case) are illustrated. Stippled areas signify "bright" plumage; white areas signify "dull" plumage. In this and Figures 3–7, molts are shown symbolically; the diagrams merely indicate the sequence of molts and plumages characteristic of each of the species. *The diagrams are not intended to show temporal position or duration of any of the molts, or extent of partial molts.*

4. A NEW APPROACH TO PLUMAGE AND MOLT HOMOLOGIES

There are several weaknesses in the currently accepted concepts outlined in the previous section. One of the most important of these involves the use of the postnuptial molt as the critical landmark of

homology; the "plumages" *preceding* the postnuptial molt of different birds have been considered equivalent. The idea that it is the "nuptial plumage" that is followed by the complete molt in all birds was expressed by Dwight (1902: 249) as follows: "From time immemorial, the adult plumage of the breeding season has been accepted as the one most typical of the species, and the moult by which it is entirely swept away forms a fixed point in every plumage cycle. The plumage may well be called the nuptial and the moult the postnuptial." Thus the criterion for the homology of the "nuptial plumage" is the molt by which the nuptial feathers are *lost*. From the physiological standpoint this appears unjustified. The energy expenditure and other physiological changes connected with growth are significant in relation to the *incoming* feathers and have nothing to do with the feathers that have been shed. Determination of feather color, pattern, and shape occurs during the molt responsible for the *development* of the feather.

It seems illogical to establish the homology of a plumage by means of the molt which is responsible for the *loss* of that plumage and for the development of the *next* succeeding plumage. Yet this is precisely what is done when the postnuptial molt is used as a landmark to identify (as the "nuptial plumage") the "plumage" which *precedes* it.

The idea that the complete molt is homologous in most birds makes more sense if we associate this complete molt with the *incoming* generation of feathers. If we assume the complete molt to be homologous in most birds, then the plumage which *results from* (not precedes) this molt may more properly be deemed homologous in these birds.

Associating the complete molt with the feathers assumed thereby will also clarify the problem of the so-called "compound plumages." In most birds with two "plumages" per cycle, according to Dwight's concept, all feathers (body and remiges) are shed at the complete postnuptial molt and are replaced by a complete set of non-nuptial feathers. A partial prenuptial molt, involving body feathers but not remiges, then renews the "nuptial plumage." Therefore, when the bird is in "nuptial plumage," it is carrying *non-nuptial remiges;* i.e., remiges assumed at the postnuptial molt. However, in a bird with only a single plumage per cycle (which we have seen must, by definition, be the "nuptial plumage" in the traditional sequence), the remiges *must* consist of nuptial feathers and thus *cannot* be equivalent to the remiges of birds with two plumages per cycle. In other words, to use the same two species for illustration, the wing feathers lost by the Starling at its complete molt are nuptial feathers; those lost by

the Scarlet Tanager, having been attained with the "non-nuptial plumage," are non-nuptial feathers, and therefore *not* homologous with those lost by the Starling—*if* the traditional reasoning be pursued down the line.

These discrepancies may be resolved, first, by naming all molts on a "pre-" basis. All feathers which are renewed only once per cycle will then belong to homologous plumages regardless of the number of molts per cycle undergone by other feathers on the bird. Since the plumage attained by the complete molt of different birds is to be considered homologous, it follows that the plumage assumed at this molt by the Starling is homologous not with the "nuptial" but with the "non-nuptial" plumage of the Scarlet Tanager. The "nuptial" plumage of the latter is an "added" plumage assumed by an incomplete molt without counterpart in the Starling.

5. A PROPOSED PRACTICAL TERMINOLOGY OF MOLTS AND PLUMAGES

Of the various early efforts to arrive at a uniformly applicable terminology of molts and plumages, the system proposed by Dwight (1900, 1902, 1905) has been the foundation of most, if not all, subsequent work. Palmer (1955) and others have modified Dwight's original terminology in an effort to achieve a more truly universal applicability. Some authors (notably Salomonsen, 1939, 1941, 1949) who have studied intensively the molts of groups of birds presenting special difficulties of interpretation (e.g., *Lagopus, Clangula*) have found Dwight's terminology misleading or inadequate and have, for descriptive purposes, erected a special terminology for their subject species. The terminology has been further complicated by use of the same word "plumage" for the concepts for which we employ the separate terms "plumage," "aspect," and "feather coat."

All proposed systems of nomenclature for molts and plumages known to us have in common the fault that they derive all or part of their terminology from seasonal, reproductive, developmental, or other phenomena. Ideally, the plumage cycle should have an *independent* terminology so that molts and plumages may be considered *in relation to* other cyclic phenomena rather than named *in terms of* such phenomena. Such an independent terminology will permit clear expression of the differences in the relationship of plumage cycles to other cycles among various birds.

Dwight's original nomenclature (1900) was based partly on the seasons ("winter plumage") and partly on the reproductive cycle ("nuptial plumage"). There are obvious disadvantages to naming a plumage sequence by reference to seasons. Homologous plumages

may be worn by different birds at different seasons, even within a single species. Northern Hemisphere migrants are wearing their "winter plumage" in the Southern Hemisphere during the local summer. The terms are quite meaningless in the equatorial regions where many cyclic phenomena are correlated with dry and rainy periods rather than "summer" and "winter" (*cf.* A. H. Miller, 1954). We have already mentioned the likelihood that the plumage cycles of some birds may be less or more than a calendar year. This is also a reason to abandon the widely used term "annual molt."

Another difficulty with seasonal terms involves the relationship of plumage-names and molt-names. The nomenclature should, in some way, relate the molts and the plumages, but this has not usually been done when seasonal terms were used. When similar names *are* used for both plumages and molts, e.g., "summer plumage," "summer molt," it becomes necessary for the author to explain carefully whether (a) the molt is being named *in relation to the plumage* or merely on the basis of *season of actual molt,* and (b) if the former, whether the "summer molt" is that by which the "summer plumage" is *acquired* or *lost.*

Dwight (1902), Palmer (1955), and others, having eliminated these undesirable seasonal terms, rely principally on terms relating the plumage cycle to the reproductive cycle. Thus the plumages are called nuptial and non-nuptial, breeding and non-breeding, nesting and non-nesting, etc. Such terminologies are more nearly universally applicable than are the seasonal type, and have thus had wide acceptance. However, terminologies dependent on stages of the reproductive cycle have important undesirable features of their own. The relatively little that is known about the actual relationships between these two physiological cycles in most birds indicates that these relationships are highly variable (see, for example, Wolfson, 1954; Marshall and Disney, 1957; Miller, 1954). It therefore appears unjustified to link them in a fixed system of nomenclature. Relationships may better be defined and studied if the terminology carries no preconceived implications of dependency.

In addition, the use of plumage names based on the reproductive cycle results in misnomers when applied to the many species of birds which do not breed until after their first year. If followed unswervingly, such a terminology results in such awkward and self-contradictory circumlocutions as "1st Nuptial (Non-Breeding) plumage" (Palmer, 1955). In this same connection, a truly uniform terminology should make allowances for a species which may carry on its courtship displays in a plumage *not* homologous with the so-

called "nuptial" plumage of most birds. Salomonsen (1939: 397) points out that the display of the male Rock Ptarmigan *(Lagopus mutus)* "takes place in full S[ummer]-plumage in Scotland, in a particoloured, partimoulted dress in Scandinavia and in the pure white W[inter]-dress in Northeast Greenland." Obviously in this species no one plumage may correctly be called a "nuptial" plumage in the functional sense.

Perhaps in an effort to avoid some of the pitfalls listed above, some authors have resorted to purely descriptive names for plumages, such as bright vs. dull, ornate vs. plain, etc. The one descriptive term which has found widespread acceptance is "eclipse"; although used almost universally for ducks, it has also been applied to the "dull" or "winter" plumage of other groups, particularly the sunbirds (Nectariniidae). The word "eclipse" implies a dull plumage worn for a short time by an otherwise brightly colored bird, such as the male Mallard *(Anas platyrhynchos.)* The word becomes meaningless when an attempt is made to apply it to birds in which *both* stages of the plumage cycle are dull in color, such as the female Mallard or both sexes of the Black Duck *(Anas rubripes).* Further, the "dull" plumage assumed by males of the brightly colored ducks at an age of 12 or 14 months is universally called the "first eclipse" in spite of the fact that many (perhaps most) ducks have a homologous plumage immediately succeeding the juvenal plumage; the so-called "first eclipse" is therefore actually the *second* eclipse when viewed in the light of developmental homology!

Some authors, for example Witherby *et al.* (1943-1944), have partially circumvented the terminology problem by using definite names for certain plumages only, particularly those of young birds; nestling, juvenile, etc. For adults, the aspect rather than the plumage is described. This procedure is of use principally from the viewpoint of the field observer and is of little value in a detailed discussion of molt and plumage cycles in various groups of birds.

The terms used by Witherby *et al.* for the plumages of young birds (see above) introduce the problems of a terminology based on age, or developmental stage of the bird. Rather than naming the plumage itself, this method actually describes the *age of the bird* which happens to be wearing a particular plumage. Such a terminology concerns itself with such chronological events as the young bird's attainment of independence of its parents, or flight, or sexual maturity—that is, whether or not the bird breeds or is able to breed in the particular plumage. In practice, regardless of what terminology is used, it is always desirable to state chronological age at which a plumage or molt

occurs, a bird first breeds, etc. A hybrid terminology, combining developmental and plumage-stage characteristics, was proposed for use by bird-banders (Michener and Farner, 1948).

Some of the objections to an age-based terminology are similar to those cited above in connection with plumage names based on the breeding cycle. There are enough cases of species known to court or actually breed in plumages other than the so-called "adult" for the disadvantages of naming plumages in terms of supposed sexual maturity to be obvious. An ideal nomenclature would not permit us to speak of sexually mature birds breeding in "subadult" or "immature" plumages, as we so often do now. Different species obviously may be wearing different plumages (from the developmental standpoint) when they first become sexually mature.

It is thus our contention that currently used terminologies for molts and plumages have a sufficient number of serious drawbacks to warrant a thorough revision. We have no argument with the findings of modern workers regarding the nature and pattern of plumage succession of birds as it may be related to seasonal rhythms, reproductive cycle, ontogeny, and various other environmental and endocrinal phenomena. We do contend, however, that these phenomena may be related in different ways in different groups of birds, and that these relationships can only be obscured by making the nomenclature of plumages and molts contingent on stages of any other cycle or developmental process. There is clearly a need for a semantically "clean," independent, uniform, and practical terminology applicable to plumages and molts of all birds. The desirable attributes of such a terminology may be listed as follows:

1) The nomenclature must consist of terms which are independent of other terminologies applied to birds.

2) It must be capable of expressing homologies, and therefore must be based on some reasonable assumptions upon which to fix the homologies.

3) The nomenclature must be flexible; i.e., adaptable to all known (and reasonable, yet so far undiscovered) modifications of the patterns of plumage succession.

4) The nomenclature must be consistent and as simple as possible.

We are fully aware of the vast amount of work yet to be done, particularly on the more aberrant groups of birds, before anything like a full understanding of the biology of molts and plumages can be achieved. Our aim is to present what we believe to be an improved means of communication for presenting the results of such studies.

We endeavor also to introduce a terminology of molts and plumages which will assist in clarifying homologies.

We advocate retention of the familiar term **juvenal plumage** for the first covering of true feathers. As mentioned in the introduction, the juvenal plumage itself does not come within the scope of the present paper, but is mentioned here because we begin with the replacement of the juvenal feathers. This has traditionally been known as the "postjuvenal molt," and described as either "complete" or "incomplete" by Dwight and other authors. However, since *all* of the juvenal feathers are eventually lost and replaced, it is misleading to speak of an "incomplete postjuvenal molt." Since several molts may be involved in the replacement of all of the juvenal feathers, the collective term "postjuvenal feather replacement" may be used when this phase of plumage succession is being studied, but it should *not* be used as a formal molt name. As mentioned earlier, we believe that molts should be named in terms of the incoming generation of feathers; thus, instead of "postjuvenal molt," we conceive of the total postjuvenal feather replacement as being accomplished in one or more "pre-" molts.

In birds which have, as "adults," one plumage per cycle (*viz.* the Starling), this plumage is almost invariably lost and renewed by a complete molt. We have selected the term **basic** for this plumage. The molt by which the basic plumage of "adults" is renewed is thus the *prebasic molt*. Although complete in "adults," this molt may be either complete or partial in young birds undergoing postjuvenal feather replacement.

In birds which have, as "adults," two plumages per cycle (*viz.* Scarlet Tanager), the complete molt is again the prebasic molt, followed by the basic plumage. The basic plumage in such birds is followed by another plumage, i.e., generation of feathers (usually comprising feathers other than the remiges and rectrices), which we propose to call the **alternate** plumage. The intervening molt is thus the *prealternate molt*, usually partial, but complete in some species (viz. the Bobolink). In most birds with two plumages per cycle, the basic plumage is completely renewed every cycle, while for part of the cycle the feather coat is a composite of retained basic feathers (usually remiges and rectrices) plus body feathers of alternate plumage attained at the partial prealternate molt.

A few species have evolved a cycle in which, as "adults," more than two molts occur. The plumage resulting from such an additional or supplementary molt is called the **supplemental** plumage.

Such a plumage may be inserted in the typical two-plumage cycle either before or after the alternate plumage; its position will depend on the functional basis for the evolution of such an additional plumage. Much additional work is needed on the plumage homologies of those species in which a supplemental plumage has developed.

For those species (such as the Herring Gull, *Larus argentatus*) in which age classes are identifiable for the first year or more through plumage characteristics, the names of the plumage stages may bear numerical prefixes such as first prebasic molt, first basic plumage, first prealternate molt, etc., as needed. Traditionally, the plumage which, once attained, does not change further with age has been called "adult;" thus, "adult nuptial plumage," "adult non-nuptial plumage," etc. But, as mentioned earlier, the word adult when used in this connection, has an implication of sexual maturity which is misleading, since many species of birds may breed before attaining "adult" plumages. Therefore, we suggest the term **definitive** for those plumages which do not change further with age; thus it might be said of a given species that its second alternate plumage is followed by its definitive basic plumage. All plumages may not reach the definitive condition during the same year of a bird's life; thus, the often bright and ornamental alternate plumage may not reach the definitive condition in some birds until the third or fourth year, while the more conservative basic plumage may not undergo any further detectable change after the second year.

After the juvenal plumage has been lost, the plumages of a bird are ordinarily acquired and lost in cyclical fashion. For example, the male Scarlet Tanager, a bird with two plumages per cycle, and first-year individuals recognizable as such, has a cycle which may be diagrammed as in Figure 2.

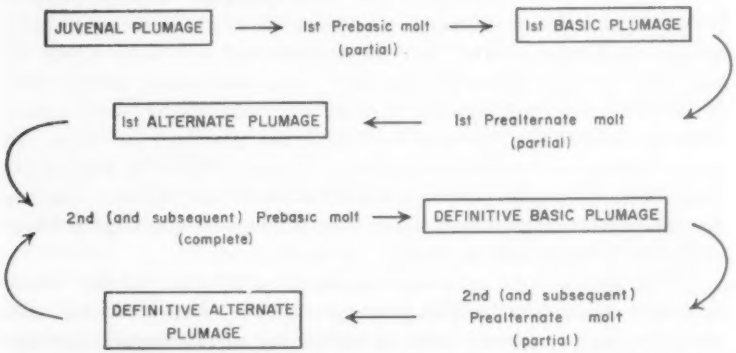

FIGURE 2. Pattern of plumage succession of Scarlet Tanager *(Piranga olivacea)*.

To clarify further our interpretation of the homologies of molts and plumages, we present below a comparative list of our proposed nomenclature (which reflects our interpretation of homologies) and the nomenclature of Palmer (1955), which is modified from that of Dwight (1902). The list shows the nomenclature for a bird with two plumages per cycle; the names of those molts and plumages missing in birds with but a single plumage per cycle are enclosed in square brackets []. The few special cases involving supplemental plumages are not shown here. Plumage names are in **bold face**, molt names in *italics*. It should be noted that the starred (*) terms in the left-hand column are usually not plumages as we have defined the word, but are in most cases applied to feather coats consisting of more than one plumage.

OLD	NEW
juvenal	**juvenal**
postjuvenal	*first prebasic*
*[**first non-nuptial**]	**first basic**
[*first prenuptial*]	[*first prealternate*]
***first nuptial**	[**first alternate**]
first postnuptial	*second prebasic*
[**second non-nuptial**]	**second basic**
[*second prenuptial*]	[*second prealternate*]
***second nuptial**	[**second alternate**]
etc.	etc.

The old and new concepts of plumage homology and nomenclature are compared diagrammatically in Figure 3.

We are well aware that difficulties will be encountered in applying this terminology to certain groups of birds. In some cases this will prove to be due to incomplete knowledge of the molts and plumages of that group, and further study will show that such birds conform to the pattern of homology outlined above, with, of course, their own specialized modifications of the pattern. Other cases may well show that parts of our fundamental thesis need to be altered or broadened. We feel, however, that an understanding of the most prevalent patterns of plumage and molt and their homologies is a necessary prerequisite to the study of groups which may seem to depart from those patterns, and we believe the system outlined above will aid materially in gaining such an understanding. Examples of the problems which will eventually need to be studied from the viewpoint of homology may be found among the loons *(Gavia)*, the leaf-warblers *(Phylloscopus)*, and the sunbirds *(Nectariniidae)*.

There is much controversy and confusion in the literature with respect to the wing-molt of loons; the remiges have been stated to be shed (1) at the prebasic molt in the fall; (2) at the prealternate molt in the spring (thus making the prebasic molt partial and the prealternate complete, a reversal of the normal

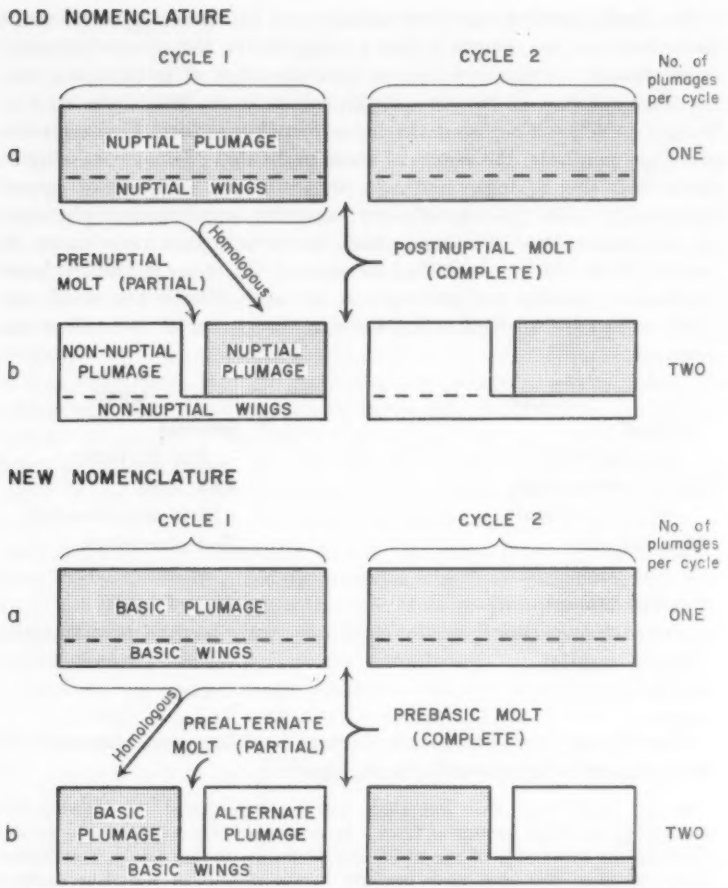

FIGURE 3. Comparison of old and new nomenclatures and concepts of equivalence. Stippled plumages are considered equivalent in each case.

situation); or (3) twice, both in spring and fall. There may be variation of the wing-molt within the genus *Gavia* or even within a single species.

In *Phylloscopus* there appears to be an unusual amount of variation in the extent of the molt or molts. Among the species described by Witherby *et al.* (1943, vol. 2: 1–27), the following patterns of feather replacement are listed: complete prebasic, no prealternate *(P. schwarzi);* complete prebasic, partial prealternate *(P. collybita, inornatus, proregulus, fuscatus); partial* prebasic, *complete* prealternate *(P. trochiloides, sibilatrix, borealis);* complete prebasic, complete prealternate *(P. trochilus).* A detailed study of molt patterns in *Phylloscopus*

would obviously be rewarding, since at least three species are said to reverse the normal pattern of complete prebasic and partial prealternate molts.

It is possible that in certain species of sunbirds *(Nectariniidae)* the dull basic plumage may be completely suppressed, since males of some species molt directly from a bright to a bright plumage, while in other, closely related species, the males wear a dull "eclipse" plumage for part of the cycle (Mackworth-Praed and Grant, 1945). The matter is further complicated by the variation among closely related species in presence or absence of a dull plumage between the juvenal and first bright plumages. This family thus presents one of the most challenging problems in the study of plumage succession. The theory that the basic plumage may have been completely suppressed in some sunbirds is buttressed by the situation in many ducks, in which the first basic plumage is rudimentary (Schiøler, 1921 and 1925), and the later basic plumages are held for but a few weeks and may even be partly or completely lost in some individual birds (Hochbaum, 1944: 112). As emphasized above, the more thoroughly the typical patterns are understood, the more conspicuous will be these and other apparent exceptions which need further study.

6. Patterns of Postjuvenal Feather Replacement

As mentioned earlier, postjuvenal feather replacement is invariably complete in the sense that all juvenal feathers are eventually replaced during the course of one (the so-called "postjuvenal") or more molts. There are many variations in the program of postjuvenal feather replacement. Such variations involve not only the number of molts undergone in total replacement of the juvenal feathers, but also the *extent, temporal position,* and *duration* of the molt or molts.

The following variations may occur in the number of molts taking place before postjuvenal feather replacement is completed:

1. One molt, the *first prebasic* (see Figure 4a). Williamson's (1956) study of plumage succession in Anna's Hummingbird *(Calypte anna)* illustrates the occurrence of complete postjuvenal feather replacement in a single prebasic molt. Compare our figures 4a and 8.

2. Two molts, the *first and second prebasics* (see Figure 4b). Steller's Jays *(Cyanocitta stelleri)* completely replace all juvenal feathers in two molts, the first and second prebasic molts, as Pitelka's (1958) excellent study shows. Compare Figures 4b and 9.

3. Three molts, the first *prebasic, first prealternate,* and *second prebasic* (see Figures 4c and 4d). In most species known to us in which three molts occur before the juvenal plumage is completely replaced, *only two* of these molts (the first and second prebasic molts) actually involve shedding and replacement of juvenal feathers. The first prealternate molt in these species replaces first basic feathers—*not* juvenal feathers. This pattern of postjuvenal feather replacement is described by Miller (1928 and 1931) for the Loggerhead Shrike *(Lanius ludovicianus;* see Figures 4c and 10).

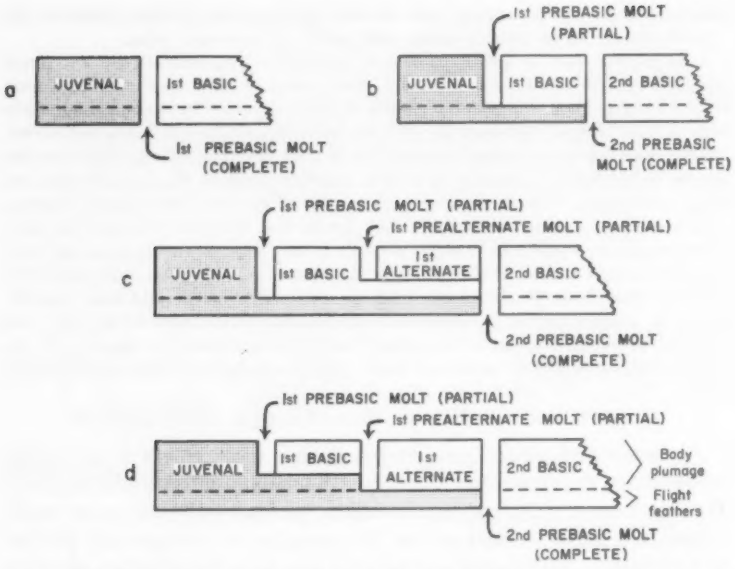

FIGURE 4. Four patterns of postjuvenal feather replacement. The molts are indicated symbolically; no indication has been made of their extent (other than partial or complete), temporal position, or duration. The juvenal plumage may be lost in one molt (a), two molts (b and c), or three molts (d). Stippled areas signify juvenal plumage.

Phillips (1951) has shown that in the Rufous-winged Sparrow (*Aimophila carpalis*) certain of the juvenal wing and tail feathers are replaced at the first prealternate molt. Thus, in at least this one species, some juvenal feathers are replaced in each of three successive molts.

7. PATTERNS OF SUCCESSION OF DEFINITIVE PLUMAGES

One molt and one plumage per cycle.—In this and the following discussions of patterns of plumage succession we will be dealing only with plumage and molt cycles occurring after plumages have become definitive. It is not practicable for us to treat here all of the tremendous number of patterns of plumage succession which occur in nature as a result of combinations of variations in pattern of *juvenal feather replacement, replacement of undefinitive plumages,* and *replacement of definitive plumages.*

Birds with one molt (prebasic) and one plumage (basic) per cycle may or may not exhibit sexual dimorphism of plumage color. The

complete prebasic molt may vary in temporal position, duration, and in order within the molt. The complete cycle may be less than a year (this needs documentation), more commonly a year, or in some cases (some cranes? *cf.* Mayaud, 1950) greater than a year in length.

There are three common variations in "brightness" or "dullness" of the basic plumage in the two sexes. Males and females of many birds (e.g. *Thryothorus, Troglodytes*) wear dull basic plumages (one useful but not invariable criterion of the "dullness" of a basic plumage is general similarity to the juvenal plumage). In an Icterid, the Red-winged Blackbird *(Agelaius phoeniceus),* and many harriers *(Circus)* the male wears a bright definitive basic plumage and the female a dull one rather like that of the juvenal. In some species, such as the Emperor Goose *(Anser canagica)* and the European Robin *(Erithacus rubecula),* both sexes wear a bright basic plumage quite different in appearance from that of the juvenile.

It is clear that "dullness" and "brightness" are more or less subjective terms when used to describe the appearance of a bird's plumage. Also, the appearance of the juvenal plumage may be affected by a wide variety of selective agencies and hence cannot be used comparatively as an invariably trustworthy criterion of the "dullness" of a definitive plumage. The important thing we wish to stress here is that sexual dimorphism of plumage color has developed in various groups of birds having only one plumage and one molt per cycle.

Male with two molts and plumages per cycle, female with one.—Witschi (1935, 1936) states that males of certain weaverbirds *(Pyromelana, Euplectes, Quelea)* have two plumages and molts per cycle, while the females have but one. This needs more study.

The occurrence of a "bright" alternate plumage in males of a species in which the females are alleged to have only a single molt per cycle, wearing the dull basic plumage throughout, is of particular interest since it further supports our contention that the alternate plumage is an "added" plumage. It also supplies us with a condition intermediate between 1) that in which both sexes wear only a basic plumage throughout the cycle, and 2) that in which both sexes have an added alternate plumage as well. This suggests that there are at least two evolutionary paths by which sexual dimorphism of plumage pattern and coloration may be attained: 1) by the *"brightening"* of the basic plumage in one sex, or 2) by the *addition* of a "bright" alternate plumage in one sex.

One complete and one partial molt per cycle in both sexes.—A great many species of birds have two molts per cycle, one complete (the

prebasic) and one partial (the prealternate). Numerous different variations in this pattern of plumage succession are possible. The complete prebasic molt varies in temporal position and duration; the partial prealternate molt varies in extent as well as in temporal position and duration.

The partial prealternate molt may involve only a very few feathers (e.g. *Lanius ludovicianus;* Miller, 1928) or nearly all of the feathers on a bird. The definition of a partial molt might include both the replacement of a single feather and the replacement of all but a single feather. It is impracticable to try to make use of such a refined definition. In most cases partial molts involve the body feathers. If

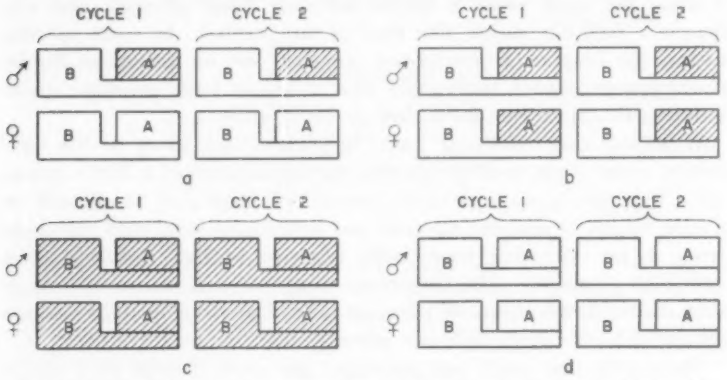

FIGURE 5. Variations in "brightness" and "dullness" of plumage in birds which have two plumages and two molts (one of them partial) per cycle. Shaded areas indicate "bright" plumage; unshaded areas indicate "dull" plumage. B = basic; A = alternate.

any feathers at all are retained, some of the remiges usually are among them. A partial molt will seldom involve *all* of the remiges but *not* the feathers from some other tracts.

Alternate plumages of many birds are sexually dimorphic (e.g. many Anatinae). In species with a sexually dimorphic alternate plumage, the females may change relatively little in aspect at the prealternate molt (e.g. *Anas platyrhynchos*). In other cases, the female, although decidedly "duller" than the male in alternate plumage, is nonetheless "brighter" than is either sex in the basic plumage (e.g., some species of *Dendroica*). The latter situation prevails in the Phalaropes (Phalaropodidae), except that in this family the female is the "bright" sex.

A great many species of birds exhibit seasonal dimorphism in that

they have a non-sexually dimorphic alternate plumage which differs more or less strikingly from the basic plumage (e.g., Podicipedidae, Alcidae, etc.) (see Figure 5b). Such specialized, non-sexually dimorphic alternate plumages presumably have some importance in relation to the reproductive cycle, serving perhaps in mutual displays, or to facilitate species recognition, or perhaps as a response to differing environmental conditions on summering and wintering areas.

The alternate and basic plumages in both sexes are "dull" and practically identical in many species of birds. In some cases (e.g., some waterfowl) this suggests secondary loss of sexual dimorphism of plumage coloration without loss of the "added" alternate plumage. At some time in the history of such species the male alternate plumage was presumably bright in contrast to the dull alternate plumage of the female. This appears to be illustrated well by the Mallard and its insular relatives, *A. wyvilliana* and *A. laysanensis*.

Abrasion of the plumage may have been the selective influence in some species (e.g., Savannah Sparrow, *Passerculus sandwichensis*) bringing about the evolution of an alternate plumage to replace badly worn basic feathers. In such cases the alternate plumage appears to be practically identical with the basic plumage (Figures 5c and 5d).

Two complete molts per cycle.—Very few species are known to have two complete molts per cycle. One such species is the Sharp-tailed Sparrow *(Ammospiza caudacuta)*, which shows little sexual or seasonal dimorphism. In the Bobolink, which also has two complete molts per cycle, the male wears a bright alternate plumage which is replaced by a basic plumage like that of the female. The basic and alternate plumages of the female are practically identical.

There may be species in which the male has two complete molts per cycle and the female either 1) only one complete molt per cycle, or 2) a complete and a partial molt per cycle. We are not aware of such species, but this is a possible intermediate stage in the evolution of patterns of plumage succession.

Supplemental plumages.—A few species of birds have three molts and plumages per cycle, the third or supplemental plumage being an "added", usually specialized, plumage in addition to the basic and alternate plumages. Males of the Ruff *(Philomachus pugnax)* have a supplemental plumage, according to Kozlova (1957), while females do not. The Oldsquaw has a supplemental plumage (*cf.* Salomonsen, 1941 and 1949; Stresemann, 1948; and Sutton, 1932). Males and females of three of the four species of ptarmigan have supplemental plumages (*cf.* Salomonsen, 1939). Salomonsen (pers.

comm.) says that Johnsen (1929) has shown that some populations of Willow Grouse *(Lagopus lagopus)* have four generations per cycle of certain feathers. This is the only species, thus far, to which *two* supplemental plumages have been attributed; these may be distinguished nomenclatorially by the letters "A" and "B".

For illustrations showing possible patterns of plumage succession involving three molts and plumages, see Figure 6.

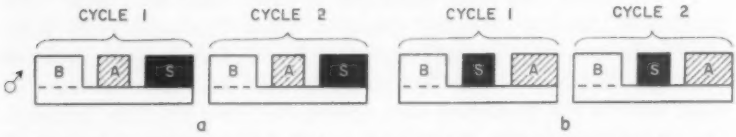

FIGURE 6. Possible patterns of plumage succession in which some feathers are replaced three times during a cycle. Shaded areas indicate alternate plumage; black areas indicate supplemental plumage; white areas indicate basic plumage.

Summary of patterns of plumage succession.—The various patterns of succession of plumages may be outlined as follows:

I. *One complete molt and one plumage per cycle.*
II. *Two molts and two plumages per cycle.*
  A. Prealternate molt partial
  B. Prealternate molt complete
III. *Three molts and three plumages per cycle.*
  A. Presupplemental molt follows basic plumage
  B. Presupplemental molt follows alternate plumage.

Upon these patterns of plumage succession may be superimposed the several variations in postjuvenal feather replacement and in sexual and/or seasonal dimorphism described earlier.

Phylogeny of "bright" plumages.—We believe that the plumages of most birds probably were not originally sexually, seasonally, or developmentally dimorphic (or polymorphic) but were dull or subdued in color and pattern; these "primitive" or "ancestral" plumages were most likely renewed periodically and completely by *protracted* molts.

These assumptions seem to us reasonable because: 1) Dull juvenal and female-like plumages of many sexually dimorphic groups are taxonomically conservative in contrast to the bright sexual plumages of males (Trochilidae, Anatidae, etc.). 2) In sexually dimorphic birds with an "added" sexual (alternate) plumage in males, the nonsexual (basic) plumage in most cases resembles the female and juvenal plumages. 3) The bright male sexual (alternate) plumage of two-

plumaged, sexually dimorphic species, is undoubtedly an "added" plumage since it is acquired (with rare exceptions) by a partial molt, and is present as a "special" second plumage in males of some groups of birds in which females are said to have but a single, dull plumage per year (some Ploceidae). 4) In some groups of birds (viz. Anatidae), some members of which have two molts per year and a bright sexual plumage in males (Anatinae), the species which are considered "primitive" (Anserinae) have but one molt and one plumage per year. 5) Since the plumage comprises approximately ten per cent of the total weight of a bird, replacement of the plumage requires a considerable expenditure of energy. It seems reasonable

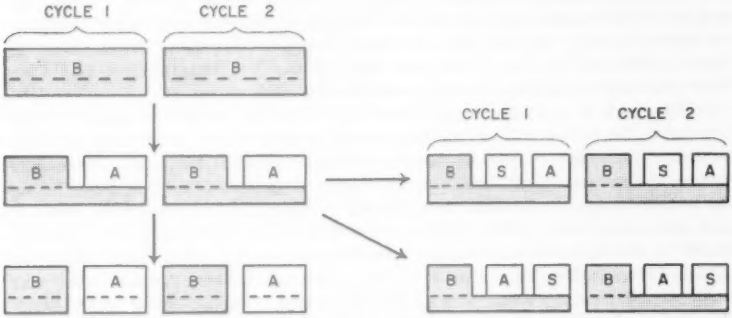

FIGURE 7. Comparison of patterns of plumage succession indicating ways in which increase in complexity may have occurred. Stippled areas indicate basic plumage.

to suppose that primitively this energy expense was budgeted over a fairly long period of time. In view of the total expenditure of energy required for the development of a whole new generation of feathers, temporal compression of molt would be disadvantageous unless counterbalanced by other requirements (*cf.* Lesher and Kendeigh, 1941). Such activities as migration, reproduction, temperature regulation, or development may make it necessary that many feathers be replaced in a short period of time (wing molting in ducks, etc.).

The great existing variability of feather morphology, color, and pattern, and of timing and duration of molts, indicates the presence of many types of selective pressure. It seems reasonable to us to assume that such selection may account for most of the presently known deviations from the generalized "ancestral" or "primitive" condition hypothesized above.

We have not attempted to outline all possible variations in pattern

of plumage succession and their possible derivations; there is too little information for this sort of speculation. However, remembering that the number of molts per cycle and the extent of each may have resulted from any number of selective influences, it is possible to construct a simple diagram which illustrates the several general patterns of succession of definitive plumages, and suggests ways by which these might have been derived (see Figure 7).

8. EXAMPLES

To illustrate in detail the application of our terminology to the three major patterns of postjuvenal feather replacement and the two most common molt sequences, we have selected three species, the molts and plumages of which have been thoroughly described in recent papers. In each of the following discussions, and in the accompanying diagrams, we have paid particular attention to *extent*, *temporal position*, and *duration* of molts; diagrams of molt sequence prior to Figures 8, 9, and 10, have not taken these factors into consideration and have illustrated molts symbolically without relation to time or extent.

In Figures 8, 9, and 10, the period during which the juvenal plumage is worn is stippled, the period of basic plumage white, and the period of alternate plumage shaded. The black areas represent periods of molt. Variation within the species in the onset and completion of a molt is indicated by the spread along the horizontal axis of the black area (except in Figure 10, for which this information is not available). The duration of molt for a single individual is approximated by the diagonals forming the lateral borders of the black areas. Thus, in Anna's Hummingbird (see Figure 8), the onset of the first prebasic molt may occur at any time from late May to mid-September. An individual which began this molt in late May would complete it early in October.

The diagrams have been divided horizontally by a dashed line to show separately the molting periods of body plumage and flight feathers. Further refinement of the diagrams could be achieved, if desired, by separate plotting of any given feather tract, if sufficient information were available. Thus, for some species it would be desirable to divide the diagram into three parts rather than two, breaking "flight feathers" into remiges and rectrices.

Molts and plumages of the male Anna's Hummingbird.—Williamson (1956) has described the molts and plumages of Anna's Hummingbird in sufficient detail to allow a diagrammatic presentation of the molts of that species (see Figure 8).

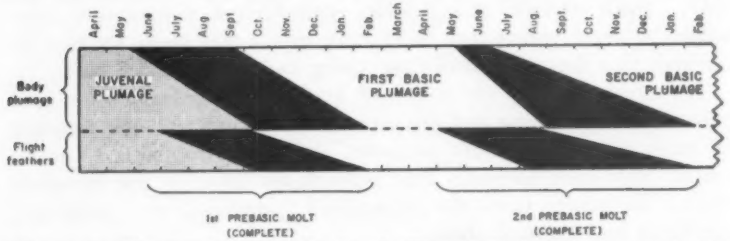

FIGURE 8. Plumage succession in Anna's Hummingbird *(Calypte anna)*. See text for discussion. Compare with Figure 4a.

All postjuvenal feather replacement in Anna's Hummingbird occurs during the complete first prebasic molt. This "molt may begin as early as late May, and birds in the earliest stage of molt may be found as late as September. Molt in some birds continues into January and as some of these birds are in a middle or late-middle stage of molt, feather replacement undoubtedly occurs in some instances into February. Thus, on a population basis, molt occurs over a period of eight to nine months. . . . The postjuvenal molt [= first prebasic molt] in the individual is estimated to take approximately four and one-half months. In certain individuals there may be a retardation of molt in winter to the extent that it may require about six months" (Williamson, 1956: 346). "Such retardation . . . may be related to changes in food, qualitative or quantitative, in the course of the fall and early winter. It has been observed in the field that the birds congregate at this time about favorable food sources and the juvenal males are less successful than adults in maintaining feeding territories" (*op. cit.*: 355).

Second and subsequent prebasic molts are complete and take place as follows: "molt may begin as early as the first week in June and . . . even earlier. Refeathering of the head, the last stage in the molt, may occur as late as January. The period of time over which molt may be underway in at least some members of the population is eight months. . . . The total period of molt in the individual is three to three and one-half months." (*op. cit.*: 351).

"The molt of adults is similar in most respects to that of the juveniles. The molt of adults is briefer. . . . It commences in the alar tract, whereas in the juvenile it commences in the ventral tract" (*op. cit.*: 355).

Molt in Steller's Jay.—The molts of a population of Steller's Jay from Graham Island (northernmost of the Queen Charlotte Islands, British Columbia) have been studied in great detail by Pitelka (1958). Figure 9 is based entirely on data drawn from Pitelka's excellent study.

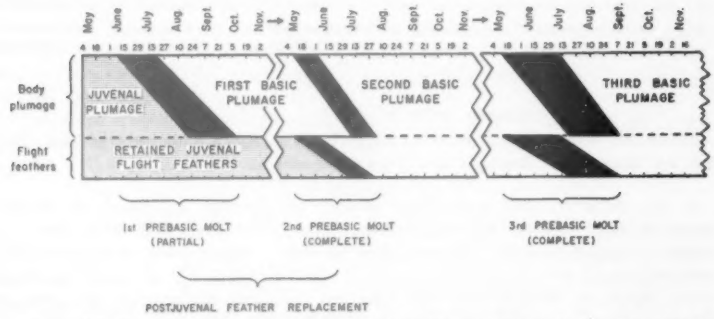

FIGURE 9. Plumage succession in Steller's Jay *(Cyanocitta stelleri)*. See text for discussion. Compare with Figure 4b.

Postjuvenal feather replacement in Steller's Jay is completed in two molts, e.g., the partial first prebasic molt and the complete second prebasic molt. Thereafter, Steller's Jays wear basic plumage and replace it once a year during a complete prebasic molt.

The first prebasic molt "begins in the interval from June 10 to July 20, and juveniles individually take 70 to 80 days to molt" (Pitelka, 1958: 49). "The flight

feathers, alula, greater primary coverts, and a variable number of the greater secondary coverts are retained" (*op. cit.*: 40). The onset of the first prebasic molt occurs shortly before the juvenal rectrices have completed their growth. In Steller's Jays from "lower latitudes there is typically a time gap between the end of growth of juvenal rectrices and the onset of the postjuvenal [= first prebasic] molt" (*op. cit.*: 41).

The second prebasic molt [= Pitelka's "first complete molt"] begins in the interval from May 9 to June 4. Pitelka (*op. cit.*: 42) had insufficient material to determine the ending of this molt or its duration in an individual; he states that "the period of molt in the individual" is "presumably [the] same as other complete molts."

The third and subsequent prebasic molts begin "in the interval from May 12 to July 10, and adults individually take 60 to 70 days to molt" (*op. cit.*: 49). The flight feathers are replaced during approximately the same period as the body plumage.

Molts of the Loggerhead Shrike.—Post-juvenal feather replacement occurs during the first and second prebasic molts in the Loggerhead Shrike; the first prealternate molt as far as known replaces only first basic feathers. The plumage sequence of adults involves two molts: a complete prebasic and a partial prealternate molt.

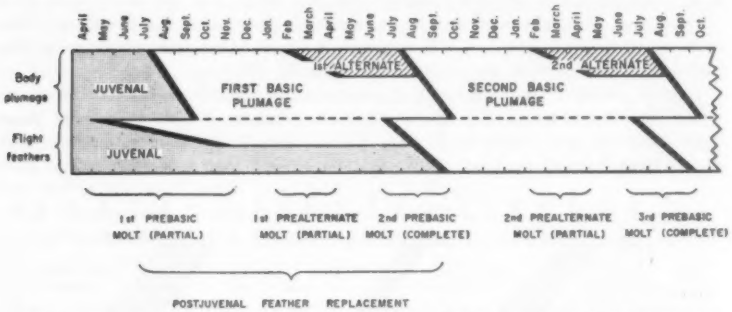
April May June July Aug Sept. Oct. Nov. Dec. Jan. Feb March April May June July Aug Sept. Oct. Nov. Dec. Jan. Feb March April May June July Aug. Sept. Oct.
Body plumage
Flight feathers
JUVENAL
FIRST BASIC PLUMAGE
1st ALTERNATE
SECOND BASIC PLUMAGE
2nd ALTERNATE
JUVENAL
1st PREBASIC MOLT (PARTIAL)
1st PREALTERNATE MOLT (PARTIAL)
2nd PREBASIC MOLT (COMPLETE)
2nd PREALTERNATE MOLT (PARTIAL)
3rd PREBASIC MOLT (COMPLETE)
POSTJUVENAL FEATHER REPLACEMENT

FIGURE 10. Plumage succession on Loggerhead Shrike *(Lanius ludovicianus)*. See text for discussion. Compare with Figures 4c and 5b.

A. H. Miller's (1928 and 1931) studies of plumage succession in shrikes illustrate the extensive individual and regional variation that may occur in extent, temporal position, and duration of molt. Figure 10 is a diagrammatic presentation of the sequence of molts in one race *(gambeli)* of the Loggerhead Shrike based on Miller's data. We have not indicated the possible variations in extent, temporal position, or duration of molt. Nor have we attempted to do more than indicate that in the population a given molt occurs during a given period of time.

The first prebasic molt is a partial molt which shows considerable variation in extent. In *gambeli*, approximately 30 to 40 per cent of the population does not renew any juvenal primaries during the first prebasic molt; 95 to 100 per cent of the population replaces all greater secondary upper coverts; and between 70 and 90 per cent of the population replaces all rectrices (Miller, 1931: 133–139). "The time occupied in molting is between three and four months for any

one individual, usually three and one-half months. For a population taken as a whole the total length of the period in which molt may be encountered depends on the length of the breeding season and of the summer season which follows" (*op. cit.*: 130). The first prebasic molt occurs in *gambeli* from the latter part of April to the latter part of November; molting of the body plumage occurs from the middle of July to the beginning of October (*op. cit.*: 131).

The first prealternate molt occurs "from February to April, or rarely May. . . . The peak of activity occurs in the latter part of February and during March. . . . Whether all birds undergo this molt and whether all individuals molt feathers other than those of the throat, could not be ascertained. At best, the prenuptial [= prealternate] molts are little more than sporadic feather replacements, and the resulting freshening of the normally white throat produces little or no change in appearance" (Miller, 1928: 409).

The second and subsequent prebasic molts are complete. The flight feathers are shed and replaced during the period from the first of July into the first week of October; the body plumage is completely renewed from the last week of July to the middle of October (Miller, 1928: 411). "The period of July, August, and September, during which adult annual [= prebasic] molts have been found to occur is probably a longer period than that required by any one average individual. The previously established mean period of three and one-half months for the incomplete [= first prebasic] molt of first fall birds seems to be at least fifteen or twenty days longer than the probable mean period for adults. . . . adults show more rapid replacement within the different feather groups—adult molts [= prebasic] may be characterized as more vigorous, precise, and rapid than the first fall [= first prebasic] molt" (*op. cit.*: 413).

"Adult annual [= prebasic] molts replace all feathers of the body. But, in first fall birds, only certain feathers being replaced, it would seem logical to suppose that these replacements constitute an adaptation for the purpose of reinforcing the most vulnerable parts of the plumage. Such plumage parts, although not seriously worn at the time of the first fall [= first prebasic] molt, might, if not replaced, reach a dangerous stage of disintegration by the following summer" (*op. cit.*: 414).

The second and subsequent prealternate molts are in all respects similar to the first prealternate molt (*op. cit.*: 409).

SUMMARY

A re-evaluation of the currently accepted terminology of plumages and molts is presented. The significance of the complete "post-nuptial" molt as a landmark of plumage equivalence is supported, but the importance of the plumage gained at this molt should be stressed rather than that of the "plumage" lost. The plumage attained at the complete molt may be considered homologous in most birds; other plumages have evolved as additions in response to various types of selection.

A practical terminology is suggested for the description of molts and plumages and for indicating homologies between different groups of birds with respect to patterns of feather replacement. The new

terminology is needed to replace older ones which were semantically dependent on other phenomena.

Existing patterns of feather replacement are enumerated, in order of increasing complexity, from a hypothetical ancestral condition.

Application of the terminology and its use in graphic representation are illustrated, using previously published data on *Calypte anna*, *Cyanocitta stelleri*, and *Lanius ludovicianus*.

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SEVENTY-SEVENTH STATED MEETING OF A.O.U.

The Seventy-seventh Stated Meeting of the American Ornithologists' Union will take place August 25 to 28, 1959, at Regina, Saskatchewan. Robert W. Nero is Chairman of the General Committee on Arrangements. Chairmen of the subcommittees are: Miss Joyce Dew, Exhibits; Elmer Fox, Finance; Frank H. Brazier, Accommodations and Transportation; Bruce Knox, Meals; Fred G. Bard, Field Trips; Richard W. Fyfe, Publicity; Mrs. John Hodges, Registration; Miss Gertrude Murray, Wives; and James Millington, Visual Aids.

NOTES ON *HELICOLESTES HAMATUS* IN SURINAM

BY F. HAVERSCHMIDT

The Slender-billed Kite *(Helicolestes hamatus)* is a reputedly rare South American hawk about whose behavior little has been published. In general slaty color it resembles the Everglade Kite *(Rostrhamus sociabilis)*, with which it was long confused, and from which it differs, among other respects, in being a plumper, heavier bird, with rather short broad wings and a short tail.

Distinguishing Characters

In view of the confusion between these two species, found even in the "Catalogue of Birds in the British Museum" (Sharpe, 1874: 327–329), it is desirable to call attention to some of the salient differences.

When seen in life, *Helicolestes* shows no similarity to *Rostrhamus*, for its short tail and broad wings make it look like a buzzard *(Buteo)*, while the long tail and wings of *Rostrhamus* suggest a harrier *(Circus)*. In all plumages *Helicolestes* differs from *Rostrhamus* in lacking white upper and under tail coverts.

The weight of specimens collected by me in Surinam show that *Helicolestes* is a considerably heavier bird than *Rostrhamus*. *Helicolestes hamatus:* 5 ♂♂ 377–448 (423) gms., 7 ♀♀ 367–485 (426) gms. *Rostrhamus sociabilis:* 3 ♂♂ 304–374 (347) gms., 1 ♀ 385 gms.

Sharpe (1874) mistakenly applied to the adult plumage of the Slender-billed Kite, the name *Rosthramus* [*sic*] *sociabilis* (Vieillot), which belongs to the Everglade Kite; the immature plumage he called a different species, *Rosthramus taeniurus*, while the Everglade Kite he designated *Rosthramus leucopygus*. In this treatment Sharpe relied mainly on Schlegel (1862). Bangs and Penard (1918) put an end to the confusion by giving descriptions (based on seven Surinam skins) of adult and immature plumages and by erecting for *hamatus* a new genus, *Helicolestes*. My twelve specimens show the following characters:

Adults: Both sexes alike, wholly slate gray with black tips to the primaries and tail. Soft parts—iris yellow (not red, as described by Schlegel and Sharpe); bill black; cere and lores scarlet orange; feet scarlet orange; claws, black.

Immatures: Unlike *Rostrhamus*, similar to adults in color, but 2 to 4 white bands on the tail and some rusty edgings on wings and scapulars (Plate 1).

Range

So far as known, *Helicolestes* has a very patchy distribution in northern South America. It is recorded from eastern Peru, from a few rather scattered Brazilian localities in lower Amazonia, from Surinam, and from a few places in Colombia (Hellmayr and Conover, 1949). It was recorded from Venezuela for the first time as

Helicolestes hamatus in Surinam. *(Above)* Immature at edge of pool, Nickerie, Oct. 1957. (Photo by D. C. Geyskes.) *(Below)* Undamaged shells of *Pomacea dolioides* under resting place of *Helicolestes hamatus*, Paramaribo, Jan. 17, 1954 (Photo by F. Haverschmidt.)

Helicolestes hamatus in Surinam. *(Above)* Tree with nest, Paramaribo, July 20, 1958. Nest is on main branch extending diagonally to left where it divides into smaller branches (see arrows). *(Below)* Downy nestling, Paramaribo, July 21, 1958. (Photos by F. Haverschmidt.)

recently as 1946, on the Colombian frontier in Apure (Phelps and Phelps, 1957). It is not recorded by Chubb (1916) from British Guiana.

DISTRIBUTION AND HABITAT IN SURINAM

Strangely enough, this species is not mentioned at all by the Penard brothers (1908) from the Guianas. However, *Helicolestes* is not at all rare in Surinam. I have many records from widely scattered localities in the western half of the country. I have collected it on both sides of the Surinam River and observed it along the Saramacca and Coppename rivers, along the road leading westwards from the Coppename River to Coronie and along the Nickerie River in the most western part of the country.

It is confined to the coastal plain, a broad belt of low swampy country, which is about 40 kilometers deep near Paramaribo, becomes narrower near the Marowijne in the east, and much wider towards the Corantijn River in the west. This swampy belt is interspersed with numerous sand and shell ridges covered with high and dense woodland, running more or less parallel to the coastline. Extensive clay swamps and marshes, mostly covered by grasses, are found between the ridges.

In contrast with *Rostrhamus,* which favors open fresh water, marshes and flooded rice fields, *Helicolestes* is not a bird of open country. It frequents the wooded ridges just mentioned, where it sits on a lookout at the edge of some overgrown pool or small swamp. It has adapted itself to cultivation, as it is of regular and quite frequent occurrence along the trenches in coffee plantations, which, owing to the coffee trees and their taller shade trees, form a somewhat forest-like habitat.

FEEDING HABITS

Helicolestes, like *Rostrhamus,* apparently feeds exclusively on large snails of the genus *Pomacea.* Its hunting method is different. *Rostrhamus* quarters like a harrier, flying back and forth over open water, catching snails with its talons and then going to a stump or fence to extract the snail from its shell in a way described by Murphy (1955). I have never seen *Helicolestes* quarter over water. Usually it has been sitting motionless on a low branch of a coffee tree overhanging water or among thick shrubbery at the edge of a small pool, waiting to pounce downward and to catch its prey. I have not been able to determine whether the snail is taken with the talons or the bill, or to see how the snail is loosened from the shell. As the bill of *Helicolestes* is slender and deeply hooked like that of *Rostrhamus,* the

extraction is probably effected the same way in both species. Several times I have found a pile of empty and undamaged snail shells assembled under a perch of *Helicolestes* (Plate 1). Dr. D. C. Geyskes of Paramaribo identified these shells as *Pomacea dolioides* (Reeve). When doing archeological work on one of the sand ridges in the Nickerie District in October, 1957, Dr. Geyskes was lucky enough to observe an extremely tame individual, which returned daily to a small pool where it sat on a low stump looking for snails, and which at last became so confiding that it could be approached and photographed (Plate 1). It was a bird in immature plumage, as shown by the rusty edgings on the wings and the white tail band.

Other Behavior

Rostrhamus is a social bird living and nesting in groups. It roosts socially in great numbers as I have described elsewhere (Haverschmidt, 1954). *Helicolestes,* on the other hand, is a relatively solitary bird, which I have seen circling in the air usually in pairs or small groups.

Helicolestes is rather noisy. The call note I have heard is a long-drawn mewing "Weéeeuuuu." This was uttered in alarm, when I suddenly surprised a bird sitting on an overhanging branch near the water, but also when it circled in pairs high in the air, resembling with its broad rounded wings and its short tail a buzzard *(Buteo).* I have watched it countless times circling over my garden at the edge of the plantation "Ma Retraite" near Paramaribo, usually in pairs, sometimes three or four birds, and on October 8, 1953 six, and on October 30, 1956 as many as eight, one of them being an immature.

Sometimes a peculiar flight was observed under these circumstances. They would suddenly stop circling, fly in a straight direction with rapid wing beats, the tips of the wings curled upwards a little, and then stop abruptly and shoot upwards. At the end of the upward stoop they resumed flying with accelerated wing beats. Once I saw one of a circling pair suddenly stop and make a downwards dive with half closed wings. During their circling the mewing cry is constantly uttered; in fact it is their cry that generally draws my attention to the circling birds.

Nesting

As nothing is known about its nesting, I always had hoped to find a breeding pair. A female collected on June 22 had an enlarged ovary, so its breeding period could be expected in the long rainy season.

In the plantation "Ma Retraite" behind my garden there are some

swampy places in which many trees of different size grow with an almost unpenetrable undergrowth. At the edge of these places I had seen *Helicolestes* many times so I suspected them of breeding in that habitat. Here and there in the coffee plantation are a few colossal cotton-trees *(Ceiba pentandra),* their huge main trunks and crowns towering over the coffee trees and their shade trees, but I had never seen the birds about the cotton-trees.

On July 20, 1958, while I was passing one of these cotton-trees, a *Helicolestes* rose from its crown and started circling just above it, all the time uttering its mewing cry. As I watched through my binoculars, it repeatedly alighted on different brances to rise again and circle around the tree. Then I lost sight of it for a moment. Suddenly I noticed the bird (or perhaps its mate) alighting silently on one of the big side branches, and then I saw that it stood on the rim of a nest. After a while it settled down on the nest and remained there. When I returned a short time later, the bird was still sitting in its nest.

The nest was placed on a strong lateral main branch on a spot where the first slender side branches protruded in every direction (Plate 2). The nest, about 20 meters above the ground and not very large, was of the usual hawk type, made of dead sticks.

I took immediate steps to investigate the nest's contents, but cotton-trees are difficult to tackle because of the huge dimensions of the trunk. However, on July 21, two expert Javanese climbers of the plantation managed to reach the nest, after two hours of hard work and with the help of ropes. The nest proved to contain a single downy nestling, which was brought to me (Plate 2).

The nestling. Its general color was mouse brown, with a dirty white stripe over the back; its head was dirty white with a mouse brown triangle on the top. Soft parts were as follow: iris black; bill glossy black, with the white egg tooth still on the upper mandible, cere and sides of bill orange yellow; inside of the mouth reddish pink; feet orange yellow with claws glossy black. The head markings of the nestling were extremely similar to those of the nestlings of *Rostrhamus sociabilis* on the photograph in Bent (1937).

The nestling uttered a loud "hee." I tried to keep the young bird alive by feeding it on small snails, but it died after three days. Its skin (my field number 3435) is in the Leiden Museum.

I wish to thank Mr. W. B. Leeuwenburgh, manager of the plantation "Ma Retraite," without whose generous help the nest never could have been reached.

SUMMARY

Helicolestes hamatus is a medium-sized South American hawk somewhat resembling the Everglade Kite, *Rostrhamus sociabilis,* but lacking the white upper and under tail coverts, and having broad, rather short, wings and a short tail, so that in shape it is more like a *Buteo.* Weights of 12 specimens are given, and compared with weights of *Rostrhamus.*

Helicolestes, though generally regarded as a rare bird, is not rare in Surinam. It frequents overgrown places near water on the coastal plain and is of regular occurrence in shade trees along the trenches in coffee plantations.

It feeds on large snails, *Pomacea dolioides,* which it captures by pouncing down from a lookout above water. Accumulations of undamaged snail shells can be found under its favorite perches.

On July 20, 1958, a nest (hitherto unrecorded) was found at about 20 meters above the ground in a huge cotton-tree *(Ceiba pentandra)* in a coffee plantation near Paramaribo. It contained a single downy nestling. The nestling is described and pictured.

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THE IMPACT OF DEFORESTATION ON BIRDS OF CEBU, PHILIPPINES, WITH NEW RECORDS FOR THAT ISLAND

BY D. S. RABOR

Cebu Island, in the central Philippines, is one of the ten large islands of the archipelago, with an area of about 4390 square kilometers. Though hilly, it reaches no great height, the maximum elevation being 1013 meters in Mt. Cabalasan in the central part.

The island was probably originally forested. Before the coming of the Spaniards, in 1521, the population probably raised only rice as a food crop. This could be grown only on favorable areas in the narrow coastal plain. Thus deforestation was limited. With the arrival of the Spaniards, and the introduction of corn, sweet potato and cassava (all native to tropical America), which could be raised more widely on lowlands and hills, deforestation continued. Within historic times Cebu has been densely populated compared with nearby islands. Before population pressure the forests disappeared. This deforestation was hastened by the wasteful method of shifting cultivation (kaingin system) practiced, in which land is cleared, planted to crops for a few seasons, then abandoned for a new clearing.

When ornithological collecting was started on Cebu in 1872, the forests were limited to patches in a few parts of the island. In 1906, when McGregor and his assistants collected on Cebu, they already had difficulty in finding forests in which to collect.

For some decades the Bureau of Forestry has been carrying on reforestation projects on Cebu, the most notable of these being in Toledo and in the hills near the water reservoir of Cebu City at Buhisan Dam. Up to 1941, the Bureau's efforts were progressing and new forests were being developed. The Second World War broke out and when it ended in 1945, nothing much was left of the government-created forests. The people had cleared most of them as well as the beginning luxuriant growths in many places in the hills and mountains of Cebu. Today, the Bureau of Forestry is again very seriously carrying on reforestation work in several parts of Cebu.

In our work from Silliman University in Cebu, begun in 1947 (see below) and in aerial survey of the island, we have been unable to find any patches of original forest, and the best bird area we found was the newly developed forest near Buhisan Dam.

Ornithological History of Cebu

Several collectors have worked on Cebu. Among them were A. B. Meyer in 1872, J. B. Steere (First Steere Expedition) in 1874-75,

J. Murray (Challenger Expedition) in 1874, A. H. Everett in 1877, Second Steere Expedition (J. B. Steere, F. S. Bourns, E. L. Moseley, D. C. Worcester) in 1888, Menage Expedition (F. S. Bourns and D. C. Worcester) in 1892, and R. C. McGregor in 1906. Since McGregor's work on Cebu in 1906, no serious ornithological collecting has been done on this island until 1947, when my students, assistants and I started to make collections of the land vertebrates on Cebu. One objective was to find out how the land vertebrate fauna, especially the birds, have fared in the face of the excessive deforestation suffered by this island during the twentieth century. In this study, Mr. Filomeno Empeso, a Field Assistant of the Biology Department of Silliman University, has aided me very efficiently.

Collecting was carried on periodically in several places on the island. To date about 1100 bird specimens, among other land vertebrates, have been collected on Cebu. The collections are at present in various institutions, the bulk of them in the Chicago Natural History Museum (CNHM) and in Silliman University (SU), and a few in the Yale Peabody Museum (YPM).

R. C. McGregor (1909. "A Manual of Philippine Birds,") lists 154 species from Cebu, of which 123 are resident, 30 migrant, and 1 of doubtful status. D. S. Rabor (1952. Auk, 69 (3): 253–257) added two new records of resident forms, raising the total to 156.

The present paper reports 10 new bird records for Cebu, which include 6 resident and 4 migrant forms. This raises the total number of birds known from Cebu to 166, of which 131 are resident, 34 migrant, and one of doubtful status. Of the 10 new records, 8 are represented by actual capture of specimens, and two by sight records on various occasions.

Three interesting aspects of the bird life on Cebu Island are discussed below: a. the status of the 10 endemic forms; b. forest species; c. new records.

The vernacular names follow in general those in Delacour and Mayr, 1946, "Birds of the Philippines," (MacMillan Co.).

Endemic Forms

Ten endemic forms (see list below) have been recognized for Cebu. All presumably were forest birds. We were able to find only one of these, the Black Shama, *Copsychus cebuensis.*

The following is a list of the endemic birds with their present status:

Phapitreron amethystina frontalis Bourns and Worcester. Amethyst Brown Fruit Dove.—Collected by Bourns and Worcester, 1892, and not found since then. Preferred hill and mountain original forests.

Loriculus philippensis chrysonotus Sclater. Philippine Hanging Parakeet.—Collected by: Meyer, Steere, Everett, Steere Expedition (second), Menage Expedition, McGregor. Not found since McGregor collected it in 1906. The species prefers original forests of the lowlands and hills, but also ranges in the coconut groves and second growth. Breeding, however, takes place in original forests, at the edges of same, or in forest clearings.

This species is one of the common birds that are kept as cage pets throughout the Philippines. However, in recent years, the birds that I have seen on Cebu that were kept as cage birds, were either the Mindanao race, *L. p. apicalis*, or the Negros race, *L. p. regulus*. Both forms are very abundant in their home islands. Regular peddlers bring them in boats from Mindanao and Negros and sell them in Cebu City.

Since 1947, I have not collected, nor definitely observed, the Cebu race of the species. On several occasions, however, I heard the very characteristic musical notes of the species in the coconut groves in southern Cebu. But then, nobody can be sure of the particular race of the bird that might be singing at any one time because the songs of the various races are similar. I heard the notes of the species on Siquijor Island and thought that at last we would have the chance to collect the rare Siquijor race, *L. p. siquijorensis*. The bird was collected and to our amazement, it turned out to be *L. p. regulus* of Negros. It must have been a cage escape, one of many cage birds of this species brought over from Negros.

Coracina striata cebuensis Grant. Barred Graybird.—Collected by: Everett, Bourns and Worcester, McGregor. Not found since McGregor collected it in 1906. Preferred original forests of the lowlands, hills and mountains, but also ranged in the second growth.

Coracina caerulescens alterum Ramsay. Black Graybird.—Collected by: Everett, Bourns and Worcester, McGregor. Not found since McGregor collected it in 1906. Preferred original forests in the hills and mountains.

Microscelis siquijorensis monticola Bourns and Worcester. Mottled-breasted Bulbul.—Collected by: Bourns and Worcester, McGregor. Not found since McGregor collected it in 1906. Said to live in mountain forests. Its congener, *M. p. philippinus*, is still very common in the hills and mountains, among second growth patches and even in coconut groves.

Copsychus cebuensis Steere. Black Shama.—Collected by: Steere Expedition, Bourns and Worcester, McGregor, and Empeso. Lives in original forests, dense thickets, and dense second growth mixed with thickets. Its adaptation to second growth and thickets will help much in its survival on the island. F. Empeso collected a single specimen, a male with the testes enlarged, on July 16, 1956, in dense second growth mixed with thickets.

Its congener, *C. saularis mindanensis*, is a very common bird in second growth, bamboo groves, hedge growths in cultivated areas, and even in gardens.

Dicaeum trigonostigma pallidius Bourns and Worcester. Orange-breasted Flowerpecker.—Collected by: Everett, Bourns and Worcester, McGregor. Not found since McGregor collected it in 1906. Lived in original forests in the lowlands, hills and mountains, especially close to the edges, but also ranged in second growth and clearings. McGregor (1907, Phil. Journ. Sci., II A, p. 307) based on his observations of the species on Cebu in 1906, writes: "This species is the most common member of the family *Dicaeidae* in Cebu."

Dicaeum quadricolor Tweeddale. Four-Colored Flowerpecker.—Collected by: Everett, Bourns and Worcester, McGregor. Not found since McGregor collected it in 1906. Lived in original forests in the lowlands and hills. Its congener, *D. a. australe (papuense* of authors), remains very abundant all over the island.

Zosterops everetti everetti Tweeddale. Everett's White-eye.—Collected by: Everett, Steere Expedition, Bourns and Worcester, McGregor. Not found since McGregor collected it in 1906. Lived in lowland and hill forests and also ranged in second growth.

Its congener, *Z. everetti siquijorensis,* on Siquijor Island, is still a fairly common bird in second growth patches.

Oriolus xanthonotus assimilis Tweeddale. Dark-throated Oriole.—Collected by: Everett, Bourns and Worcester, McGregor. Not found since McGregor collected it in 1906. Bourns and Worcester (in McGregor, 1909, A Manual of Philippine Birds, p. 701) write of this species thus: "*O. assimilis* is exceedingly common in the small amount of forest left in Cebu." This observation was made in 1892.

Forest Species

Some forest species that we found in the course of our work on Cebu include the following:

Ducula aenea aenea Linnaeus. Green Imperial Pigeon.
Kakatoe haematuropygia Müller. Philippine Cockatoo.
Prioniturus discurus whiteheadi Salomonsen. Blue-headed Racket-tailed Parrot.
Cuculus fugax pectoralis Cabinis and Heine. Horsfield's Hawk Cuckoo.
Ceyx lepidus margarethae Blasius. Variable Forest Kingfisher.
Pitta e. erythrogaster Temminck. Red-breasted Pitta.
Pachycephala plateni winchelli Bourns and Worcester. White-bellied Whistler.
Parus elegans albescens McGregor. Elegant Titmouse.
Sitta frontalis aenochlamys Sharpe. Velvet-fronted Nuthatch.

However, seven other forest species previously recorded were not found by us:

Gallus gallus gallus Linnaeus. Red Jungle Fowl.
Leucotreron occipitalis Gray. Yellow-breasted Fruit Dove.
Leucotreron l. leclancheri Bonaparte. Black-chinned Fruit Dove.
Ducula p. poliocephala Gray. Pink-bellied Imperial Pigeon.
Terpsiphone cinnamomea unirufa Salomonsen. Rufous Paradise Flycatcher.
Culicicapa helianthea panayensis Sharpe. Citrine Canary Flycatcher.
Chloropsis f. flavipennis Tweeddale. Yellow-quilled Leafbird.

It is possible that these and the nine endemics have disappeared from the island. However, there is also the possibility that some persist in second growth we did not find.

Many of the forest species that we found were in reforested areas, and the sole endemic rediscovered was also in such a place. Possibly some of the other forest species that we did not find may actually persist in very small numbers in scattered localities. If so, their only hope of survival on the island is to colonize and adapt to the reforested areas.

NEW BIRD RECORDS

We found several species previously unrecorded from Cebu:

Ixobrychus sinensis astrologus Wetmore, Chinese Least Bittern.—Basak, Cebu City: 1 female adult, September 5, 1956 (CNHM). Wing 130; culmen from frontal feathering 43.5 mm.

The bird was taken at the side of a small irrigation ditch in rice fields, when the rice plants were maturing. This species is not as commonly encountered as *I. cinnamomeus*, which is also found in the same type of haunts. The Chinese Least Bittern is more likely to be met with in Mangrove and Nipa swamps.

Streptopelia chinensis tigrina (Temminck and Knip), Tigrine Dove.—Tuburan, Cebu: 1 male adult, October 4, 1956 (SU). Wing 144; culmen from base 21 mm.

The Tigrine Dove is gradually extending its range in the Philippines from Palawan and Balabac (its original range in the Philippines) to Zamboanga Peninsula, Mindanao Island (Rabor, 1952. Auk, 69 (3), pp. 255–256) and Negros (Rabor, 1954, Silliman Journal, 1 (1), pp. 79–80), and now to Cebu. Although pigeons and doves are kept as cage birds in many places in the Philippines, I do not believe that the present spread of the Tigrine Dove is by this means. I am more inclined to ascribe its spread to its successful crossing and consequent colonization from one island to another, aided perhaps by the strong monsoon and typhoon winds.

Cacomantis variolosus sepulcralis (S. Müller), Rufous-breasted Brush Cuckoo.—Tisa, Cebu City: 1 female immature, January 30, 1956 (CNHM); Buhisan Dam, Cebu City: 1 male immature, July 23, 1956 (YPM); 1 female adult, October 22, 1956 (CNHM); 1 female immature, September 7, 1956 (CNHM). Wing ♂ 114, ♀ 119, 118; culmen from base ♂ 23.5, ♀ 23, 23.5 mm.

The Rufous-breasted Brush Cuckoo has been confused with *C. m. merulinus* in the past so that records of the latter on various islands, including Cebu, might really have included *C. v. sepulcralis*.

The immature female in the Chicago Natural History Museum collection has just completed its molt to the adult plumage, and one secondary and a few upper wing coverts are still of the juvenal plumage. The other immature female specimen in the same museum has still retained a few of the characteristic striped juvenal feathers on the throat and fore breast, otherwise the retaining part of the plumage is that of the adult.

The immature male in the Peabody Museum collection still possesses small remnant patches of the juvenal plumage both on the upperparts and underparts. The rectrices are molting to those of the adult.

All the specimens were taken in dense tree growths within or close to the reforestation project in the hills back of the city, in the areas surrounding the water reservoir.

Halcyon coromanda bangsi Oberholser, Ruddy Kingfisher.—Buhisan Dam, Cebu City: 1 female adult, December 12, 1955 (SU); 1 male adult, October 23, 1956 (CNHM). Wing ♂ 118, ♀ 117; culmen from base ♂ 58, ♀ 57.5 mm.

The Ruddy Kingfisher seems to be an uncommon winter visitor in the Philippines, except on Siquijor Island where 7 specimens were collected within a comparatively short time, within two remnant patches of well-logged original forest.

Three races have been identified in the Philippines: *H. c. major*, *H. c. bangsi*,

and *H. c. minor*. The first two are winter visitors in the Philippines but the last one is a breeding resident form in the Sulu Archipelago.

The two Cebu specimens are similar to the birds collected on Siquijor and Negros, which proved to be *H. c. bangsi*, after a comparative study of the various forms was made by Dr. Rand (Rand and Rabor, MS) in connection with a study of the avifauna of Siquijor Island.

At present *H. c. bangsi* has been recorded as a winter visitor on Siquijor, Negros, and Cebu.

Monticola solitaria philippensis (P. L. S. Müller), Blue Rock Thrush.—This winter visitor has not been collected on Cebu as specimen but I have seen it on several occasions, right in the city, on the stone walls and roofs of the old churches, even while I was a young boy living in Cebu City. Again, in March, 1954 and April, 1955, I saw the species in the vicinity of the same old stone churches.

Gerygone sulphurea sulphurea Wallace, Yellow-breasted Wren-warbler.—Pacna-an, Mandawe, Cebu: 1 male adult, January 31, 1954 (CNHM); Kanghabagat, Medellin, Cebu: 1 male adult, 2 female adults, July 19–21, 1954 (CNHM). Wing ♂ 50, 51.5, 51, 51.5; culmen from base ♂ 12.5, 12.5, ♀ 12.5, 12.5 mm.

The Yellow-breasted Wren-warbler, strangely enough was not collected by the earlier collectors on Cebu in spite of its being now relatively common on the island, especially in the Mangrove forest or remnant patches of it. Its song is very melodious, loud and clear and cannot be mistaken for that of any other species.

The Cebu birds do not differ from Negros and Bohol birds.

Megalurus palustris forbesi Bangs, Striated Canegrass Warbler.—Lico-lico, Cebu: 1 male adult, January 12, 1954 (CNHM); Canyasan, Cebu: 1 male adult, September 26, 1956 (CNHM). Wing ♂ 97.5, 101; culmen from base ♂ 23, 24 mm.

The Striated Canegrass Warbler is another species that is fairly common on Cebu, especially in the rice fields in the narrow coastal plain, and in the tall grass areas in the foothills. However, the bird is more often heard than seen, because of its habit of feeding on the ground among the dense tall grass and similar dense growths.

A favorite haunt of the bird is the dry rice fields after the harvest, where it feeds on the ground close to grazing carabaos and cattle. When disturbed it usually flies to the nearest tree, often *Nauclea orientalis* (Bangkal) or *Ceiba pentandra* (Doldol or Kapok), which trees are often planted as hedges around the rice fields. From the safety of a high bare branch close to or at the top of the tree, the bird gives its very characteristic call, a series of loud rolling, warbling notes, rather musical to hear.

The Cebu specimens do not differ from Negros and Bohol birds.

Muscicapa narcissina narcissina (Temminck), Narcissus Flycatcher.—Campo 3, Buhisan Dam, Cebu City: 2 male immature, November 3, 5, 1956 (CNHM). Wing ♂ 75, 77; culmen from base ♂ 13.5 14 mm.

The Narcissus Flycatcher is a rare winter visitor in the Philippines. It has been recorded so far only on Calayan, Luzon, Mindanao, and Negros. The present record on Cebu extends its winter range by one more island in the Philippines.

Muscicapa griseisticta (Swinhoe), Gray-spotted Flycatcher.—Tisa, Cebu City: 1 female adult, January 28, 1954 (CNHM); Bacsan, Cebu: 1 sex ?, December 10, 1954 (SU); Samboan, Cebu: 1 male adult, January 27, 1955 (SU). Wing ♂ 84, ♀ 84.5, sex ? 81.5; culmen from base ♂ 14, ♀ 12.5, sex ? 13. mm.

The Gray-spotted Flycatcher is widely distributed in the Philippines as a winter visitor, but is never found in large numbers in any one area. It is strange that it was not recorded on Cebu by the earlier collectors, considering the fact that it frequents even cultivated areas provided there are some tree growths around them.

Padda oryzivora (Linnaeus), Java Sparrow.—The Java Sparrow has always been a popular cage bird in Cebu and still is. Even today, several Chinese pet stores in the city always have cages just for these sparrows, oftentimes containing both the normally-colored and the albino birds. It is evident that the source of the birds that have by this time already succeeded in establishing a breeding population in the hills of Cebu, has been cage escapes. In 1922–26, as a small boy who roamed the hills of Cebu City in company with other small boys, all armed with sling shots and later, with air rifles, the Java Sparrow always attracted us whenever one was seen or a small flock observed. It was not uncommon for one or two of these birds to join the flock of the Chestnut Mannikin, *Lonchura malacca jagori*, and feed with the members. Occasionally, a flock of Java Sparrow numbering about from 6 to one dozen, was encountered, sometimes with a member or two which were albino. Somehow the species has never increased in large numbers, perhaps because of the overhunting by small boys, even up to the present.

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SUMMARY

Cebu Island, Philippines, was largely deforested by the early twentieth century and new forests, later developed by the government, were destroyed during the Second World War.

A recent survey of its bird life indicates that all but one of its endemic forms, as well as several other forest species, may have disappeared.

Ten forms (six resident) not previously recorded from Cebu were found.

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THE NATURAL TERMINATION OF THE REFRACTORY PERIOD IN THE SLATE-COLORED JUNCO AND IN THE WHITE-THROATED SPARROW

BY MAX C. SHANK

It has been demonstrated that birds of several passerine species show gonadal recrudescence within six or seven weeks, when given sufficient artificial increases in day length in late fall or in winter. Birds treated in late summer or early fall, however, do not respond. The period between regression of the gonad, normally at the end of the breeding season, and the time the gonad responds to photostimulation, has been designated the refractory period.

The experiments reported here were undertaken to determine by systematic study when the refractory period ends in the Slate-colored Junco *(Junco hyemalis)* and in the White-throated Sparrow *(Zonotrichia albicollis)*—species in which the natural termination of the refractory period had not been investigated. Secondarily, the effect of treatment with short days in the fall on the duration of the refractory period in these species was studied.

It is with a great deal of pleasure that I acknowledge the assistance and helpful criticism of Dr. Albert Wolfson. The research reported here was supported in part by a grant from the Graduate School of Northwestern University.

INTRODUCTION

Rowan (1929) observed in his pioneering experiments that Slate-colored Juncos *(Junco hyemalis)* exposed to stimulating photoperiods begun before November 1 at Edmonton, Alberta, exhibited an "irregular and slow recrudescence" of the gonads. Juncos given gradual increases in day length after November 1 showed a "regular and extremely uniform recrudescence." Although Rowan's experiments did not deal with gonadal refractoriness directly, these results indicated that a refractory period occurs in this species. Wolfson (1952a) has reported on the dissipation of the refractory period in the Slate-colored Junco. A systematic study was not undertaken, but responses of groups exposed to stimulating photoperiods between August 27 and November 8 compared with responses of other groups placed in 20-hour day lengths on December 4 led to the conclusion that the end of the period occurs between November 8 and December 4 in Evanston, Illinois.

Approximate dates for the termination of the refractory period in

other species have been reported. Miller (1948) found that the end of the refractory period at Berkeley, California, occurred between November 5 and 20 for both adult and immature Golden-crowned Sparrows *(Zonotrichia atricapilla)*. More recently Miller (1954) has confirmed this and has shown that in at least two races of the White-crowned Sparrow *(Z. leucophrys)*, termination occurs in the last week of October. His conclusions were based on responses of groups used over a period of years in a number of widely differing experiments. Wolfson (1945), also at Berkeley, obtained a response to supplementary light begun October 18 in a few White-crowned Sparrows. Oregon Juncos *(Junco oreganus)* treated at the same time did not respond. Farner and Mewaldt (1955), working with male White-crowned Sparrows *(Z. l. gambelii)* concluded that the refractory period ends, with individual variations, during the last two weeks of October and the first week of November at Pullman, Washington. All members of the groups exposed to 15-hour day lengths on November 8 and January 1 exhibited a significant gonadal response. Kendeigh (1941) found that in the House Sparrow *(Passer domesticus)* both sexes responded to gradually increased day lengths begun November 2 at Urbana, Illinois. The age of the birds was not given. Riley (1936), working at Iowa City, Iowa, found that when male House Sparrows were exposed to stimulating photoperiods begun September 30, immature birds responded, but adults did not. Davis (1953) reported the development of the gonads of immature House Sparrows in late spring, but Vaugien (1952) found refractoriness in immature House Sparrows in summer. Burger (1949) states that the refractory period probably ends in the Starling *(Sturnus vulgaris)* by mid-November at Hartford, Connecticut, but no data are given.

Regulation of the reproductive cycle by alternation of treatment with short days and treatment with long days has been demonstrated in a number of species and indicates the regulatory role of the environment in the termination of the refractory period. Wolfson (1954a) produced five cycles in the Slate-colored Junco and four in the White-crowned Sparrow in a year. Rowan (1929) obtained two cycles within a few months in the Slate-colored Junco. Miyazaki (1934) induced two cycles in the Mejiro *(Zosterops palpebrosa)* and Damsté (1947) produced three cycles in the Greenfinch *(Chloris chloris)*. The results of Wolfson (1954a) and Burger (1947) showed that short days regulate the dissipation of the refractory period in the Slate-colored Junco and in the Starling, respectively.

METHODS

Slate-colored Juncos and White-throated Sparrows were trapped on the campus of Northwestern University during the fall migration of 1951. Evanston lies within the winter range of the Slate-colored Junco, and is in the path of migration for both species. The birds were kept in a large indoor aviary until the start of the experiments. Experimental birds and controls were housed in Hendryx flight cages (24" x 15" x 19"), with a maximum of seven birds per cage. The experimental rooms and conditions and feeding were identical to those described by Wolfson (1954a) and need not be repeated here.

In order to determine when the refractory period ends for the population as a whole, several groups were exposed to highly stimulating 20-hour photoperiods beginning on successive dates. Four groups of each species were transferred at two-week intervals. The initiation and duration of treatment for each group was as follows:

Group 1—November 3—49 days (autopsied December 22)
Group 2—November 18—48 days (autopsied January 5)
Group 3—December 2—49 days (autopsied January 20)
Group 4—December 16—46 days (autopsied January 31)

Three groups were pretreated with short days before being subjected to 20-hour day lengths to study the effects of such treatment on the subsequent response. A group of twelve juncos was treated with 9-hour day lengths beginning October 3. Thirty-one days later, November 3, they were transferred to the 20-hour room and treated for forty-eight days. They were autopsied December 21. Group 1 served as controls. Two groups of White-throated Sparrows were treated in the following manner. The first group was placed in the 9-hour room on October 2. Thirty-one days later, November 2, the birds were transferred to the 20-hour room and treated for forty-nine days. They were autopsied December 21. The second group was placed in the 12-hour room on October 1. Thirty-four days later, November 4, the birds were transferred to the 20-hour room and treated for forty-nine days. They were autopsied December 23.

Data were obtained on body weight, fat deposition, and reproductive activity. Weighing was done at two-week intervals. At each weighing birds were examined for fat deposits, which were recorded as little, medium, heavy or none (Wolfson, 1942). Fat deposition occurs as a response to increasing photoperiods in some species (Wolfson, 1952b). Judgments of lipid deposits were subjective, but differences between the classes were marked. Cloacal size was noted, and

sperm smears were made from males whose cloacas were enlarged (Wolfson, 1952c). Gonads were fixed in Bouin's fluid. Testes were measured and prepared for histological study. Testicular volumes were computed from the measurements of the axes, using the formula for the volume of an ellipsoid. Stages of spermatogenesis were determined, using those described by Wolfson (1942), in which Stage 1 is minimum and Stage 5 the breeding condition. Ovaries were weighed, after treatment with 80% ethyl alcohol, on a Roller-Smith torsion balance with a sensitivity of 0.2 milligram. Ovarian follicles were measured. Degree of reproductive activity was estimated by observations on the gonads and the accessory reproductive organs. As activity increases, each ductus deferens and its seminal vesicle becomes enlarged and filled with sperm; a few large follicles differentiate in the ovary, the oviduct becomes convoluted, and its walls thicken.

Age was determined by examination of the skull at the time of autopsy. By December 20 many immature birds have skulls that are completely ossified. Since all birds were killed after that date, only those with incomplete ossification were recorded as immature.

RESULTS

Fat responses are given in Table 1. Gonadal responses are given in Table 2. These summaries mask the individual variation, which was marked in some cases as will be pointed out, but they exhibit well the differences between the groups.

Fat Responses—Slate-colored Junco—Eleven birds of group 1 showed an increase in fat. The one that did not respond, #414, lost 5.5% of its initial weight. The range of weight change was from —8.0% to +29.0%. The two males of group 2 that showed no response lost 1.1% and 3.8% of their initial body weight. The others gained from 1.2% to 26.4%. Body weight gain in group 3 was marked, ranging from 12.9% to 23.0%. In group 4 the increase was not quite so great as a whole. Individual variations, however, were greater, ranging from +6.3 per cent to +24.8 per cent. The controls showed changes ranging from —5.3 per cent to +14.0%. The latter bird, an immature female, was not as heavy as the others, both at the beginning and at the end. The birds pretreated with 9-hour days also showed great individual variation, ranging from —1.2 per cent to +25.7 percent.

Fat Responses—White-throated Sparrow.—Of the two birds of group 1 which showed increased fat, one increased in body weight 5.0 per cent. The other lost 13.5 per cent. The other birds lost from 8.1 per cent to 25.0 per cent of their initial weight. In group 2, the bird that increased its fat gained 0.4 per cent. The others ranged from a 4.6 per cent gain to a 5.3 per cent loss. Only one of the 5 birds in group 3 that showed increased fat gained weight. The gain was 2.9 per cent. The others lost from 1.2 per cent to 4.5 per cent. The two birds that did not show a fat response lost 3.6 per cent and 7.4 per cent of their

TABLE 1

FAT RESPONSES OF SLATE-COLORED JUNCOS AND WHITE-THROATED SPARROWS

SLATE-COLORED JUNCOS						WHITE-THROATED SPARROWS					
Group	*Composition*	*Periods of Treatment*	*Fat Response* +	*Fat Response* −	*Average % change in body weight*	*Group*	*Composition*	*Periods of Treatment*	*Fat Response* +	*Fat Response* −	*Average % change in body weight*
1	6♂♂, 6♀♀	Nov. 3–Dec. 22 (49)	11	1	+ 6.5	1	11♂♂, 1♀	Nov. 3–Dec. 22 (49)	2	10	−11.3
2	4♂♂, 3♀♀	Nov. 18–Jan. 5 (48)	5	2	+ 9.7	2	2♂♂, 2♀♀	Nov. 18–Jan. 5 (48)	1	3	− 0.6
3	4♂♂, 3♀♀	Dec. 2–Jan. 20 (49)	7	0	+17.1	3	3♂♂, 4♀♀	Dec. 2–Jan. 20 (49)	5	2	− 2.3
4	4♂♂, 3♀♀	Dec. 16–Jan. 31 (46)	7	0	+14.0	4	6♂♂, 1♀	Dec. 16–Jan. 31 (46)	0	7	−11.5
Controls	5♂♂, 2♀♀	Nov. –Jan. 31	4	3	+ 0.2	Controls	4♂♂, 2♀♀	Nov. –Jan. 31	4	3	+ 5.2
						BIRDS PRETREATED WITH SHORT DAYS					
Birds pretreated with 9-hour days (31 days)	3♂♂, 9♀♀	Nov. 3–Dec. 21 (48)	9	3	+12.0	Birds pretreated with 9-hour days (31 days)	8♂♂, 4♀♀	Nov. 2–Dec. 21 (49)	4	8	− 8.8
						Birds pretreated with 12-hours days (34 days)	9♂♂, 4♀♀	Nov. 4–Dec. 23 (49)	1	12	−13.8

Total number of days of treatment appear in parentheses following date of autopsy. Number shown under (+) indicates birds that moved into a higher fat class. Birds shown under (−) moved into a lower class or remained the same.

TABLE 2

GONADAL RESPONSES OF SLATE-COLORED JUNCOS AND WHITE-THROATED SPARROWS

SLATE-COLORED JUNCOS					WHITE-THROATED SPARROWS				
Group	*Total No. of birds*	*Response and measurements (means)* +		—	*Group*	*Total No. of birds*	*Response and measurements (means)* +		—
1	12	♂♂ 3	36.1	3 1.0	1	12	♂♂ 2	11.2	9 0.7
		♀♀ 4	12.7	2 2.2			♀♀ 1	6.6	
2	7	♂♂ 4	65.5		2	4	♂♂ 1	82.3	1 0.8
		♀♀ 2	19.7	1 2.6			♀♀		2 5.1
3	7	♂♂ 4	111.9		3	7	♂♂ 3	117.7	
		♀♀ 3	16.7				♀♀ 2	13.8	2 6.6
4	7	♂♂ 4	112.5		4	7	♂♂ 6	130.4	
		♀♀ 3	26.5				♀♀ 1	13.8	
Controls	7	♂♂		5 0.4	Controls	6	♂♂		4 1.0
		♀♀		2 1.7			♀♀		2 3.4
BIRDS PRETREATED WITH SHORT DAYS									
Birds pretreated with 9-hour days	12	♂♂ 3	87.2		Birds pretreated with 9-hour days	12	♂♂ 3	73.0	5 0.5
		♀♀ 8	14.1	1 } 2.2			♀♀ 2	18.8	2 5.9
					Birds pretreated with 12-hour days	13	♂♂		9 0.6
							♀♀		4 5.8

Testis volumes in cubic millimeters are given following number of males responding (+) or not responding (—). Ovarian weights (in milligrams) are given following number of females responding or not responding.

initial weight. Loss in group 4 ranged from 2.5 per cent to 26.2 per cent. The latter bird was dead in the cage on the morning of autopsy, although it had been alive the evening before. The controls showed changes ranging from —1.3 per cent to +13.6 per cent. The two birds that did not show increased fat also lost weight. The birds pretreated with 9-hour photoperiods lost from 0.9 per cent to 17.7 per cent. Again, there was no correlation between increased fat and degree of change in body weight. Those pretreated with 12-hour photoperiods lost from 6.5 per cent to 23.2 per cent of the initial body weight.

Gonadal Responses—Slate-colored Junco.—Individual responses varied considerably in group 1. Two of the males exhibited maximum activity. Histological observation showed that they had reached stage 5. Testis volumes ranged from 49.4 to 61.5 mm^3. In a third bird, the volume was 5.7 mm^3 for the left testis and 8.0 mm^3 for the right. In males that did not respond the testicular volumes ranged from 0.5 to 1.36 mm^3. In responding females, the activity ranged from moderate to maximum, with ovarian weights from 10.0 to 17.6 mg. Activity was not strictly correlated with ovarian weight. In the bird showing maximum activity the ovary weighed 11.4 mg. Several large follicles were present. The oviduct weighed 18.2 mg. The ovaries of the females that did not respond weighed 2.0 and 2.4 mg. The activity of the responding males in group 2 ranged from little to maximum. Testicular volumes ranged from 2.5 to 134.4 mm^3. Two males were at stage 5; one was at stage 4; the fourth was at stage 2. One female showed minimum activity, with an ovarian weight of 2.6 mg. One showed little activity, with an ovarian weight of 11.8 mg. The third ovary weighed 27.6 mg. and activity was submaximum. In group 3 all the males were at maximum; testicular volumes ranged from 22.0 to 205.3 mm^3. Two females exhibited submaximum activity, with ovarian weights of 9.6 and 16.6 mg. The third was at maximum with an ovarian weight of 23.8 mg. All the males of group 4 showed maximum activity, with testicular volumes ranging from 53.0 to 179.5 mm^3. One female showed submaximum activity, with an ovarian weight of 17.2 mg. The other two were at maximum, with ovarian weights of 26.2 and 36.0 mg. The controls all showed minimum activity, with the exception of one in which the testis was in stage 2. Volumes ranged from 0.2 to 0.7 mm^3. Ovaries weighed 1.2 and 2.2 mg. The last two groups, therefore, showed comparatively uniform responses.

In the group pretreated with 9-hour days, the three males were at maximum, with testicular volumes ranging from 57.1 to 108.9 mm^3. The females that responded ranged from little to maximum activity. Ovarian weights ranged from 7.2 to 22.2 mg., again with no absolute relationship between weight and activity.

Gonadal Responses—White-throated Sparrows.—One responding male of group 1 was at stage 2 and showed little activity, with testicular volumes of 2.0 and 2.1 mm^3. The other was at stage 4, had testicular volumes of 19.1 and 21.6 mm^3, and showed moderate activity. Testicular volumes of males not responding ranged from 0.4 to 1.1 mm^3. The one female showed moderate activity and the ovary weighed 6.6 mg. In group 2 the male that responded exhibited maximum activity, and was at stage 5. Testicular volumes were 86.7 and 77.9 mm^3. The other male showed minimum activity and was at stage 1. The two females showed minimum activity. Ovarian weights were 4.8 and 5.4 mg. The three males of group 3 exhibited maximum activity. Testicular volumes ranged from 68.8 to 187.0 mm^3. One female that responded showed maximum activity, the

other little. Ovarian weights were 22.0 and 5.6 mg., respectively. The other two showed minimum activity with ovarian weights of 6.2 and 7.0 mg. In group 4 all the birds showed maximum activity. Testicular volumes ranged from 58.1 to 217.2 mm^3. In the controls the volumes of the testes ranged from 0.4 to 2.4 mm^3. Ovarian weights were 2.0 and 4.8 mg.

In the group pretreated with 9-hour days, the testes of the three males that responded were at stage 5. Two showed submaximum activity, the other maximum. Testicular volumes ranged from 24.8 to 114.0 mm^3. In males that did not respond testicular volumes ranged from 0.3 to 0.8 mm^3. One female that responded showed moderate activity, with an ovary weight of 14.6 mg. The other showed submaximum activity with an ovarian weight of 23.0 mg. Ovarian weights in females that did not respond were 5.2 and 6.6 mg. In the group pretreated with 12-hour photoperiods testicular volumes ranged from 0.3 to 1.2 mm^3. Several were at stage 2, although all exhibited minimum activity. Ovarian weights ranged from 3.6 to 9.2 mg.

Gonadal Responses in Relation to Fat Responses.—Fat responses of juncos in groups 3 and 4 correlate well with gonadal responses. All birds showed gonadal recrudescence and increased fat deposits. Juncos of the other two groups were not as consistent. In group 1 several birds showed fat increases with minimum gonadal activity. In group 2 the only bird that did not exhibit a gonadal response had increased fat deposits and gained slightly in weight. Two other birds lost slightly in weight and showed no fat response, but gonadal response was evident.

The White-throated Sparrows, with few exceptions, lost weight during the course of the experiments. Three males and one female of group 3 showed both fat and gonadal responses, as did one of the males in group 2. No other bird of the first four groups showed both. Group 4 was consistent in showing maximum gonadal activity, no fat response, and considerable weight loss.

The control groups of both species varied in the amount of fat deposits. The only junco that did not show a gonadal response among the group pretreated with 9-hour photoperiods also did not show a fat response and lost 1.2 per cent of its initial weight. The other two birds that did not show fat responses gained a little more than 1 per cent of their initial weight. These changes are not significant. One male and one female of the group of White-throated Sparrows pretreated with 9-hour day lengths showed both fat increases and gonadal increases. Only one bird of the group pretreated with 12-hour day lengths showed a fat increase. It lost 11.5 per cent of its body weight.

No differences in fat or gonadal responses were found between age groups or sexes. The impression was gained, however, that the female juncos did not respond as strongly as the males.

DISCUSSION AND CONCLUSIONS

The Fat Response.—The difference in fat response between the White-throated Sparrow and other species studied, including the Slate-colored Junco, is marked. My results in this junco agree with those in the Oregon Junco and the White-crowned and Golden-crowned Sparrows (Wolfson, 1945; Miller, 1948). The White-throated Sparrow presents a somewhat different problem. The majority of my birds exhibited no fat deposition, and weight loss was almost universal except in the controls. Wolfson (1953) reported heavy fat deposition and a weight increase in eight out of nine White-throated Sparrows placed in stimulating day lengths on January 25. Wolfson (1954b) also reported a less abrupt increase in fat deposition that took place in birds under natural day length conditions in late January and early February. It seems possible that fat deposition and gonadal recrudescence are regulated differently in this species, and that the birds are refractory with respect to fat deposition for a somewhat longer period of time in the fall than with respect to gonadal recrudescence.

Natural Termination of the Refractory Period.—Results of the investigations reported here indicate that most Slate-colored Juncos are able to respond to stimulating photoperiods by November 18, and that probably all are responsive by December 2. The response of juncos exposed to long days on November 18 was not complete, either quantitatively or qualitatively. However, more than half the November 3 group exhibited a gonadal response, and all but one showed fat deposition. In earlier experiments begun December 4 practically all individuals were responsive (Winn, 1950; Wolfson, 1952b). Rowan (1929) obtained a good response in a group of seventy-five juncos given supplemental illumination beginning November 1. Possibly the latitude was a factor in obtaining this early response. Day length at Edmonton, Alberta, is much shorter by November 1 than it is at Evanston, and short days are known to speed the termination of the refractory period, as shown by this study and also by Burger (1949), Wolfson (1952b, 1952c) and Miller (1954).

For the White-throated Sparrow, the refractory period ends in the population at Evanston sometime between December 2 and 16. A few individuals gave a gonadal response when exposed to 20-hour days November 3 or November 18. Most of the December 2 group responded, but the response was not complete. In the December 16 group all individuals attained maximum gonadal activity.

Pretreatment with 9-hour days hastened the end of the refractory period in the Slate-colored Junco. The results of the experiments

with the White-throated Sparrows are not as conclusive. The fact that five out of twelve birds pretreated with 9-hour day lengths responded, and responded to a greater degree than group 1, indicates that an effect is present. However, a difference in response to treatment with 9-hour days is evident in these species. Lack of response in White-throated Sparrows pretreated with 12-hour day lengths might seem to indicate that this photoperiod failed to prepare the birds for the subsequent response to long days. A longer duration of treatment with 12-hour photoperiods, from 3-6 months however, has been effective in a few individuals (Wolfson and Shank, unpublished data, and Wolfson, unpublished data).

In both species the rate of gonadal recrudescence for responding individuals in the earlier groups appears to be slower than the rate in later groups. Earlier individuals, although treated for the same length of time, did not show as much activity as later individuals.

SUMMARY

Slate-colored Juncos were transferred from natural conditions of day length to 20-hour day lengths at two-week intervals beginning November 3. Both gonadal and fat responses showed that the refractory period ends in the population at Evanston, Illinois, between November 18 and December 2, although some individuals respond earlier.

Gonadal responses in a similar experiment with White-throated Sparrows indicate that the refractory period ends in this species some time between December 2 and 16. Fat responses were not obtained.

Juncos that were pretreated with thirty-one 9-hour days before transfer to 20-hour day length on November 3 showed both a fat and a gonadal response after forty-eight days of photostimulation. Compared with the controls, the treatment with 9-hour days accelerated the dissipation of the refractory period.

Five out of twelve White-throated Sparrows pretreated with 9-hour photoperiods for 31 days before stimulation with 20-hour photoperiods showed a gonadal response. White-throated Sparrows pretreated for thirty-four days with 12-hour photoperiods gave no response to subsequent treatment with long days.

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ON THE ANGLE OF THE CEREBRAL AXIS IN THE AMERICAN WOODCOCK

BY STANLEY COBB

One of the conspicuous things about birds is the evolutionary development of forms suited to very special environmental conditions. Examples are easy to pick out, from hummingbird to ostrich, but perhaps one of the most interesting is that caricature of the Charadriiformes, the American Woodcock *(Philohela minor)*. Evolutionary development has caused marked changes in the skull of the woodcock, especially the relation of the bones of the skull to the orbit, and to the *foramen magnum*. The unique osteology has been described by Shufeldt (1903).

Hofer (1952, 1954) has recently made careful studies of the skulls of various birds and describes two main types, the extended and the bent. He uses three axes: the axis of the bill, that of the base of the skull, and that of the brain. In the extended type of skull, these three are nearly parallel, and close together. In the bent type of skull they may make marked angles with each other. The cormorant is an example of the former; most birds are of the bent type; Hofer gives examples in his figures of parrot, hawk, pigeon and four of the snipe family, including *Scolopax*, which is the extreme of the bent type. No measurements of the angles are recorded.

The extraordinary position of the woodcock's brain within the skull, and its relation to eye and bill was brought forcibly to my attention the first time I removed the brain. It seemed to be almost upside-down with the cerebellum in a ventral position and the *medulla oblongata* leaving the cranial cavity through a ventrally placed *foramen magnum* with a slightly frontal slant (see Fig. 1).

Material and Method

In order to follow through on this preliminary observation, two more woodcock, a Short-billed Dowitcher, a Semipalmated Sandpiper, a Semipalmated Plover, and three Herring Gulls were collected. Dissections were made of formalin fixed specimens.

It was found that good fixation of the brain *in situ* could be obtained by skinning the head and neck immediately after death, removing the eyes, and then placing the whole head in 20% formalin for 10 days. After a thorough washing the dissection could be carried out using "magnifocuser" eye-glasses and small surgical rongeurs.

The skull was removed piece by piece starting at the cerebellar area where the bone is thick. The removal was carried forward, great care being taken to leave the rim of the orbit intact, to show the relationship of brain to eye. A lateral photograph was then made, showing the exposed brain, seated on the

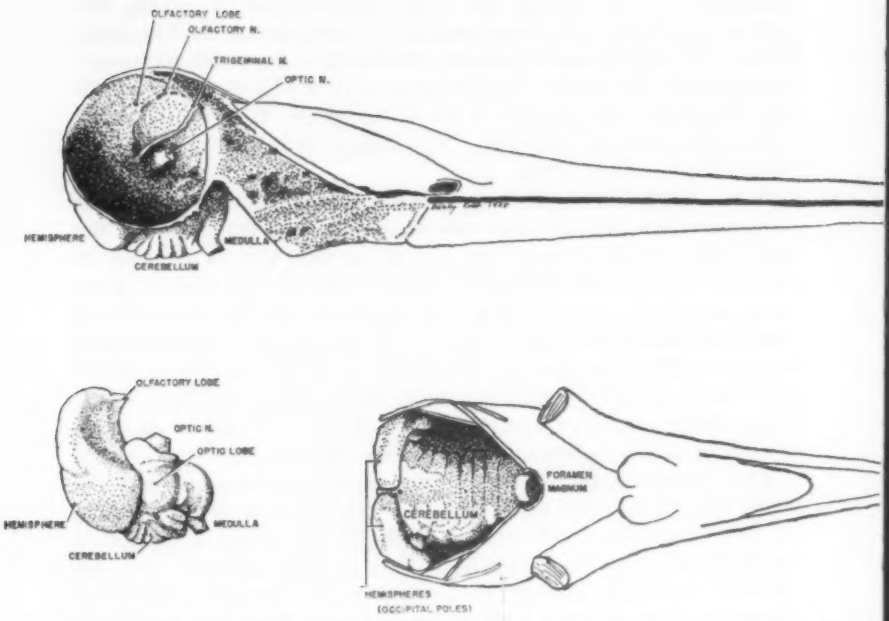

FIGURE 1. Lateral and ventral view of woodcock's brain *in situ*, and one lateral view of brain removed. The anterior part of the fore-brain and the olfactory bulb can be dimly seen through the thin bone of the orbit. The olfactory nerve going to the superior turbinal chamber of the bill can also be dimly seen. The cerebellum in the ventral view appears comparatively large because three large folia are exposed that are mostly hidden by the occipital pole of the cerebral hemisphere in the lateral views. (Dissections and drawings by the author.)

base of the skull, in its relation to orbit, nasal chambers and bill. It was difficult to make measurements directly from the specimen or even from a photograph, so tracings were made in which were emphasized the relative positions of brain, orbit, nasal chambers, nostril and bill.

On these tracings, an axis was plotted along the base of the brain, passing anteriorly through the middle of the olfactory lobe, and posteriorly through a point in the middle of the *medulla oblongata* just below the caudal tip of the cerebellum (see Fig. 2). This is called the cerebral axis. It meets a secondary imaginary line drawn the length of the bill between the mandibles and extending through the skull to the base of the brain. The angle formed by these lines is called the brain-bill angle. It seems to indicate the amount of rotation backwards of the brain from its more usual anterior position in birds that have smaller orbits and shorter bills. Taking the Semipalmated Plover as an example (Fig. 2), this angle can be measured as 85°. The error in measurement is rather large because the exact axis of the bill cannot be determined, the curve of the mandibles often not fitting any straight line. Nevertheless an average line can be chosen and the angle measured in degrees is accurate enough to permit meaningful comparisons.

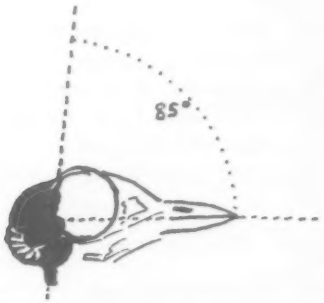

FIGURE 2. Tracing from photograph of brain and dissected skull of Semipalmated Plover, showing *cerebral axis, axis of bill,* and *brain-bill angle.*

OBSERVATIONS

Using this method, the brain-bill angles in 5 birds of the order Charadriiformes is found to be as follows:

Herring Gull *(Larus argentatus)*	34°
Semipalmated Sandpiper *(Ereunetes pusillus)*	60°
Short-billed Dowitcher *(Limnodromus griseus)*	78°
Semipalmated Plover *(Charadrius semipalmatus)*	85°
American Woodcock *(Philohela minor)*	117°

These angles between brain axis and bill are shown diagrammatically in Figures 2 and 3.

The Herring Gull is included for comparison, because of its inclusion in the order Charadriiformes (A.O.U., 1957) or Laro-Limicolae (Mayr and Amadon, 1951). It is used as an example of a member of this order that has not developed snipe-like modifications. The other three shown in Fig. 3 obviously are snipe-like, the woodcock being the extreme.

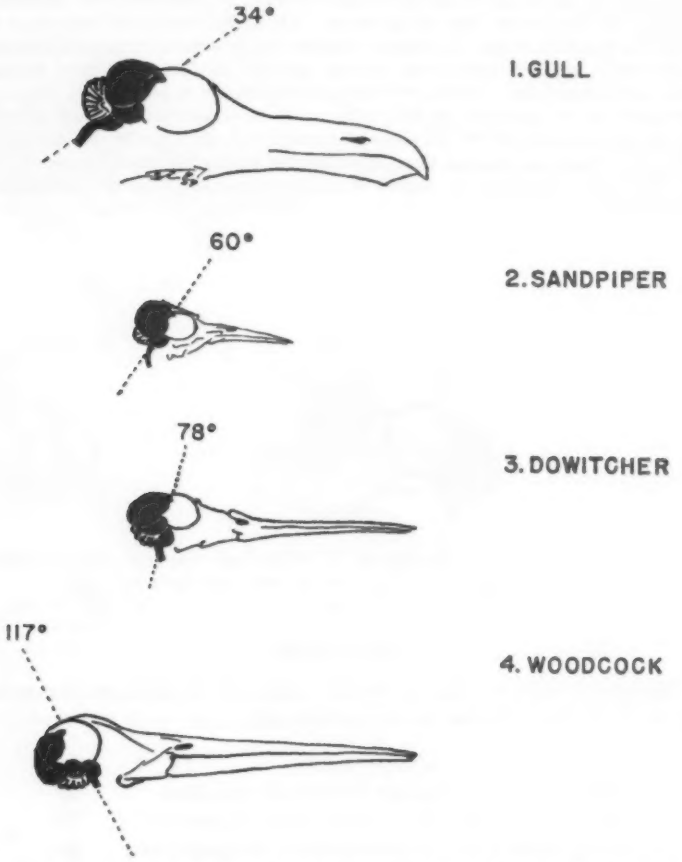

FIGURE 3. Diagrams of brains *in situ* in skulls of four Charadriiformes, showing cerebral axes (dotted lines) and brain-bill angles, measured in degrees. *(From above down) Larus argentatus, Ereunetes pusillus, Limnodromus griseus* and *Philohela minor.*

DISCUSSION

The brain-bill angle seems to give a means of measuring a significant phylogenetic change occurring in those Charadriiformes which become progressively more specialized for probing for food with a long bill in wet ground. What actually occurred during the millions of years of evolution is not known, but one can speculate as to the series of events. The eye apparently moved backward as the bill lengthened and the nostril approached the base of the bill. As the eye developed its large size and posterior position, it gained space at the expense of the fore-brain, which was rotated backward, causing the mid-brain and hind-brain to push downward and even slightly forward. The woodcock feeds largely at night, and the eye is relatively enormous. It is also more posterior (occipital) in position. This would seem to have two advantages to the bird; when feeding he can see more above and behind, and the eye will be less likely to get in the mud.

Since the evolutionary change is evidently related to such an important function as food intake, it is reasonable to look on it as caused by natural selection. But it is remarkable that such a profound anatomical reconstruction could take place within a group of such closely related species. The brain-bill angle is merely a convenient and measurable indicator of the evolutionary development.

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GEOGRAPHIC VARIATION IN THE WHISKERED AUKLET

BY BERNARD FEINSTEIN

The Whiskered Auklet, *Aethia pygmaea* (Gmelin), is a small alcid (about seven inches long) of a generally blackish color, adorned with three long tufts of white feathers projecting from the sides of the head, as well as a conspicuous recurved crest. So far as known, it breeds only on the islands between northern Asia and Alaska (the Kurile, Komandorskie and Aleutian Islands), and apparently winters in the same general area and off the adjacent coast of Kamchatka Peninsula. It has hitherto been considered a monotypic species.

While handling some specimens of the Whiskered Auklet in the United States National Museum collections, I noted that examples from the Kurile Islands (between Japan and the Kamchatka Peninsula) were larger in size and lighter in color than those from the Aleutian Islands. A search of the literature showed that Ridgway (1919: 772) had tabulated the specimen measurements, and arranged them according to their geographical localities. The east (Aleutian) to west (Kurile) disposition of these data showed the size increase I had independently observed.

Material Examined

Additional specimens were then borrowed to supplement the original material and in all some 74 specimens were amassed.

Of this total, 56 specimens were adults: 9 coming from Kurile Island localities; 31 from Komandorskie Island localities; 16 from Aleutian Island localities. The remaining 18 specimens comprised 3 downy young and 15 immature birds, one immature from the Kurile Islands and one from the Komandorskie Islands. The other 13 specimens were from Aleutian Island localities.

For the opportunity to study these birds I am indebted to the following institutions: Academy of Natural Sciences, Philadelphia; American Museum of Natural History, New York; British Museum (Natural History), London; Carnegie Museum, Pittsburgh; Chicago Natural History Museum; Museum of Comparative Zoology, Cambridge; Museum of Vertebrate Zoology, Berkeley; National Museum of Canada, Ottawa. I also wish to acknowledge my appreciation to Drs. J. W. Aldrich, H. Friedmann, H. C. Oberholser, R. W. Storer and A. Wetmore for their aid, advice and criticism. In addition I am indebted to Mr. H. G. Deignan not only for advice but for the translation of Russian works. This paper is published by permission of the Secretary of the Smithsonian Institution.

Discussion

The Whiskered Auklet is a comparatively early breeder. What little information is available of its breeding habits comes from observations by Stejneger (1885: 25) on Copper Island in the Koman-

dorskie group. He noted that the breeding birds required sites on steep rocky shores and that on the Komandorskie Islands the downy young were present by the end of June. More recently Gizenko (1955: 80) has corroborated all this.

Examination indicates the Komandorskie Islands to be an area of intergradation between the eastern and western populations. The majority of the Komandorskie Islands specimens are like the Kurile birds. Arranging the Komandorskie Islands specimens by their color characters results in a graduated series, the extremes of which approach the terminal forms but are not quite typical of them. The specimens can then be re-sorted upon their dimensional characters, and again a series is produced with the extremes falling within the ranges of the terminal forms. Therefore the terminal populations are separated by two characters, size and color. Birds from the Kurile Islands differ from the Aleutian Islands' birds in averaging larger, particularly in wing length (111.9 mm. against 103.7 mm.), in being browner (less slaty) above, and in having the breast more sharply demarcated from the white of the abdomen.

MEASUREMENTS

For the proper application of statistical methods, it is deemed best to use quantitative units to determine the significance of difference between two samples. The figures presented in Table I reveal that

TABLE I

Wing[1]

Population	*No. Specs.*	*Wing Range*	*Mean*	σM	σ
Aleutian Islands	16	99.4–108.1	103.76	± 0.75	3.01
Komandorskie Islands[2]	31	102.0–112.0	107.30	± 0.47	2.71
Kurile Islands	9	109.2–115.4	111.98	± 0.72	2.16

		Tail			*Culmen*[3]		
Population	*No. Specs.*	*Mean*	σM	σ	*Mean*	σM	σ
Aleutian Islands	16	28.99 ±	0.32	1.29	9.21 ±	0.11	0.42
Komandorskie Islands	31	29.70 ±	0.31	1.73	9.28 ±	0.90	0.48
Kurile Islands	9	30.62 ±	0.45	1.34	9.60 ±	0.11	0.33

		Tarsus			*Middle toe without Claw*		
Population	*No. Specs.*	*Mean*	σM	σ	*Mean*	σM	σ
Aleutian Islands	16	21.14 ±	0.23	0.91	22.94 ±	0.30	1.20
Komandorskie Islands	31	21.37 ±	0.14	0.80	23.52 ±	0.20	1.08
Kurile Islands	9	22.15 ±	0.18	0.53	24.36 ±	0.27	0.82

[1] Measure of the chord. σ is the standard deviation. σM is the standard error of the mean.
[2] St. Lawrence Island specimen included.
[3] Determined on 28 specimens from the Komandorskie Islands.

only the wing lengths show a mensural difference having statistical significance. It is axiomatic, in determining the difference of measures of samples, that if the sum of the standard deviations of the samples is less than the difference of the means of the samples, then five-sixths of the samples can readily be distinguished from each other. Applying this to the Table I figures for the wing measurements we have:

Population		*Difference of the means* $Ma - Mb$	*Summation of the standard deviations* $\sigma a + \sigma b$
Kurile	Aleutian	8.22	5.17
Kurile	Komandorskie	4.68	4.87
Komandorskie	Aleutian	3.54	5.72

The combination of measurements reveals that the only significant difference occurs between the two most widely separated samples.

The sexes are combined in Table I because it was found that there was no statistically significant difference in the wing measurements of the two sexes (Table 2).

TABLE 2

Wing

Population	*Sex*	*No Specs.*	*Wing Range*	*Mean*	σM	σ
Aleutian	male	9	99.4–108.1	102.80 ±	0.87	2.6
	female	5	97.3–106.0	101.90 ±	1.20	3.6
	unsexed	2	101.5, 102.0			
Komandorskie	male	15	103.5–112.0	107.48 ±	0.63	2.4
	female	14	102.0–112.0	107.07 ±	0.83	3.1
	unsexed	2	106.6, 108.5			
Kurile	male	2	110.2–113.0	111.60 ±	0.99	1.4
	female	3	110.0–115.4	112.43 ±	1.28	2.7
	unsexed	4	109.2, 115.3			

COLOR

The Aleutian birds can be distinguished from the Kurile birds on color alone. To make certain that the browner color of the Kurile birds was a constant difference, and not the result of age (foxing) or season, suitable comparisons were made. Examination of adults from the Aleutian Islands indicated that the greatest difference in color was due to the effects of wear and abrasion. The specimens in best plumage condition, those collected in April, appeared quite different from the breeding and moulting birds. The latter specimens had a brown tone due to the wear of the feather tips. A similar brown coloration was noted in several specimens that had been on exhibition and had been exposed to illumination. In specimens

undergoing moult, it was apparent that the color values of the new feathers were equal to those in the fresh plumage birds. As far as pigment deterioration is concerned, the series studied shows very little. For example, an adult male collected in May or June, 1879 at Atka Island in the Aleutians (USNM 85617) is of similar color to the more recently collected adult male specimens of various June, 1936 dates from other Aleutian Island localities (USNM 366541, 366542, 366544, 366545). The same holds true for the females. The Kurile Islands population similarly follows this pattern, even though the series of specimens is small. The entire breeding series, Aleutian and Kurile, indicate, with one exception, no color alteration within their respective groups; the exceptional case is an adult female collected in the Kurile Islands in late May, 1918 (AMNH 11120). It is in a plumage comparable to that of the April specimens, which manifest no wear at all.

SUBSPECIES

Through mensural analysis and by visual examination, the Whiskered Auklet has been determined to be composed of two morphologically distinct populations, an Aleutian Island population and a Kurile Island population, the descriptions of which follow:

Aethia pygmaea pygmaea (Gmelin)

Alca pygmaea Gmelin, Syst. Nat., 1, (2), p. 555, 1789. Based on the Pygmy Auk, Pennant, Arct. Zool., vol. 2, p. 513, 1785. ("circa insulam avium inter Asiam septentrionalem et Americam.") = St. Matthew Island.

Description.—Summer Adult (sexes similar). Colors based on Ridgway's Color Standards (1912). Head and neck black, shading to slate color on rump, back and upper tail coverts; upper surfaces of rectrices chaetura black; sides of head, except lores, chaetura black; lores white; throat and upper breast chaetura black, grading to deep mouse gray on lower breast and flanks; abdominal area pale smoke gray, changing to white on the under tail coverts; primaries fuscous-black; bill (dried skins) red, the tip yellowish; feet, webs and tarsi (dried skins) averaging brownish; ornamental tufts white; except for the black frontal crest. The winter adult plumage similar to that just described, bill brown.

The immature plumage like that of the adult, except for the absence of filamentous plumes, and lack of bright bill color; bill dark. The downy young entirely covered with fuscous down feathers, lighter on the under surface than the upper surface.

Measurements.—Adult male (9 specimens), wing (chord) 99.4–108.1 (102.8); tail 26.5–30.1 (28.9); culmen 8.4–10.0 (9.2); tarsus 19.2–23.1 (21.3); middle toe without claw 21.4–25.6 (23.3); frontal crest (extended at right angles to base) 34.6–47.2 (39.3) mm. Adult female (5 specimens), wing 97.3–106.0 (101.9); tail 28.2–30.4 (29.2); culmen 9.0–9.7 (9.3); tarsus 20.1–22.0 (20.7); middle toe without claw 22.2–23.3 (22.8); frontal crest 28.2–40.0 (33.9) mm. Unsexed (2 specimens), wing 101.5, 102; tail 26.2, 30.9; culmen 9.1, 9.2; tarsus 21.0, 22.9; middle toe without claw 20.3, 23.0 mm.

Specimens examined.—Alaska: 1 ad., Bethel, no date; 1 imm., no data; Aleutians:

Atka Island, 1 ♂ ad., May or June, 1879; 3 ♀ ads., April, 1924; imm., no date; Akun Island: 1 ad., Feb., 1922; 2imms., Aug., 1901; Akutan Island: 3imms., Sept., 1874 and Aug., 1901; Amchika (= Amchitka) Island: 2imms., July and 1imm., Aug. 1873; Chugulak (= Chagulak) Island: 1 ♂ ad., June, 1936; Gareloi Island: imm., Aug., 1901; Herbert Island: 2 ♂ ads. and 1 ♀ ad., June, 1936; Kagamil Island: 1 ♂ ad., June, 1936; Kiska Islands, Kiska Harbor: 1imm., no data; Unalaska Island, Dutch Harbor: 1 ♂ ad., June, 1901; Unamak (= Unimak) Island: 1imm., no data; Unalga Pass: 2 ♂ ads. and 1 ♀ ad., Oct., 1931.

Range.—The Aleutian Islands from Akun Island west to the Rat Islands; one record from Bethel, Alaska.

Remarks.—The Bethel specimen (ANS 35095) is referable to the Aleutian population and is probably a wanderer from one of the Islands.

The Committee on Classification and Nomenclature of the American Ornithologists' Union (1957: 255) restricts the name *Aethia pygmaea* (Gmelin) to the "Islands in Bering Sea." This is based upon Gmelin (1789: 555), who cites the description of the Pygmy Auk by Pennant (1785: 513). Pennant states that the Pygmy Auk was seen "in vast multitudes" about "Bird Island", which was visited by Captain Cook on his last voyage. Since two distinct forms of the Whiskered Auklet are here recognized, it is necessary to determine whether *pygmaea* refers to the Aleutian or to the Kurile form.

Stresemann (1949: 246, 251) has identified the Bird Island of Captain Cook's last voyage, referred to by Pennant, as St. Matthew Island in the Bering Sea, formerly known as Gore Island. Unfortunately, the type specimen no longer exists (Stresemann, 1949: 247–248), so there is no way of knowing whether it belonged to the Aleutian population, the intermediate Komandorskie population, or the distinct Kurile population. The recognition of two distinct forms of Whiskered Auklet makes it necessary to assign Gmelin's name to one or the other race. As St. Matthew is an American island, north of the Aleutians, the probability is that the type belonged to a population like that of the Aleutians rather than that of the distant Kuriles. I therefore use *pygmaea* as the name of the Aleutian form. Should it be determined that the Whiskered Auklet breeds on St. Matthew and is subspecifically distinct, another name would have to be found for the Aleutian population.

The restriction of *Aethia pygmaea pygmaea* to the Aleutian Islands form would seem to leave the Kurile Islands population without a name. A search of the synonomy produced an available name. Lepechin (1801: 369) described a new alcid from Kamchatka, for which he proposed the name *Alca Camtschatica.* It is the oldest available name for the Whiskered Auklet with a definite Asiatic locality, Kamtchatka. There is a possibility that the specimen described originated in the Komandorskie or Aleutian Islands, but if the specimen had been collected on the islands in the Bering Sea, that fact would probably have been noted, since most of the islands were known by this time. Lepechin gives the distribution of his species as ranging from the islands between America and Kamchatka itself. In view of the name he gave to it, I am inclined to believe that the specimen Lepechin described came directly from the coasts of Kamchatka, or possibly from one of the northernmost Kurile Islands, which are separated from the Kamchatka Peninsula by a distance of only a few miles. I designate Kamchatka as the type locality. This species is abundant in the waters about the tip of Kamchatka, and according to Clark (1910: 32) and Dybowski (1884: 3) it occurs off the Kamchatkan coast.

While the diagnostic characters noted by Lepechin in his description are of little value in determining the population to which his specimen belonged, the illustration which supplements the text contains characteristics indicative of the Kurile population. The illustration shows a specimen with long ornamental crests, brownish flanks and breast and a restricted white abdominal area. This latter character is rather consistent in the Kurile group. The coloring of the breast does not continue into the abdominal area so that there is a line of demarcation which is not found in the Aleutian skins.

An incidental problem arising with the resurrection of the name concerns its correct spelling. In the text, the description is entitled, *Alca Camtschatica* (Lepechin, 1801: 369), while the plate is entitled *Alca Kamtschatica* (1801: after p. 104). The specific name containing the initial *C* appears only once, in the title of the article. In the text, the land area, Kamchatka, is spelled with an initial *K*. It seems probable that Lepechin intentionally attempted to latinize the name of the area by using *C* in the spelling of the specific name. The specific name accompanying the plate may have been inserted by someone other than Lepechin. The displacement of the plate by several hundred pages from the text is believed to have been a matter of facilitating the binding of the volume, in which all the illustrations occur in one portion of the volume. It was the consensus of inquiries into this problem that the name accompanying the text was the available one.

The Kurile Islands population is then characterized as:

Aethia pygmaea camtschatica (Lepechin)

Alca Camtschatica Lepechin, Nova Acta Academiae Scientiarum Imperalis Petroprlitanae, tom. 12, pl. 8, p. 369, 1801. ("In insulis inter American Septentrionalem et Kamtschatcam sitis." = Kamchatka.)

Description.—Differs from *Aethia pygmaea pygmaea* in being browner, less blackish and averaging larger in all respects; significantly longer wing; white abdominal area sharply demarcated from brown of breast; head and neck blackish-brown, shading to dark neutral gray on back, rump and upper tail coverts; upper surface of rectrices chaetura black; sides of head, except lores, blackish-brown; lores white; throat and upper breast fuscous-black; lower breast and flanks hair brown; under tail coverts and abdomen white; primaries fuscous; bill (dried skins) red, the tip yellowish; feet, webs and tarsi (dried skins) averaging brownish; ornamental crests white, except for blackish frontal crest.

Measurements.—Adult male (2 specimens), wing 110.2–113.0 (111.6); tail 31.0–33.5 (32.2); culmen 9.1–9.7 (9.4); tarsus 23.0–23.1 (23.05); middle toe without claw 24.3–25.1 (24.7); frontal crest 46.2–52.0 (49.1) mm. Adult female (3 specimens), wing 110.0–115.4 (112.4); tail 28.1–31.0 (30.1); culmen 9.5–10.2) (9.8); tarsus 21.3–22.0 (21.7); middle toe without claw 24.3–26.1 (25.3); frontal crest 48.2–53.1 (49.8) mm. Unsexed adults (4 specimens), wing 109.2–115.3; tail 30.0–31.2; culmen 9.1–9.9; tarsus 22.0 (4); middle toe without claw 23.2–25.0 mm.

Specimens examined.—Kurile Islands: 1 ♂ ad., June; 1 ♂ ad., May, 1901; 3 ♀ ads., 1 no date; 1 May, 1918; 1 July, 1884; 3 unsexed ads., no dates; 1 unsexed ad. Japan, no date; 1 imm., no date; 1 unsexed ad., summer of 1882. Komandorskie Islands; Bering Island: 1 ♀ ad., May, 1883; 1 imm., Aug., 1882; Copper Island: 2 ♂ ads. and 3 ♀ ads., Jan., 1883; 1 ♀ ad., Jan., 1911; 1 ♀ ad., Jan., 1916; 1 ♂ ad., Feb., 1911; 1 ♀ ad., Feb., 1916; 1 ♂ ad., Mar., 1883; 1 ♀ ad., Mar., 1912; 1 ♂ ad., May, 1912; 1 ♂ ad., 1 ♂ imm., June, 1883; 1 ♀ ad., June, 1911; 1 ♂ ad., July, 1882; 1 ♂ ad.,

July; 1 ♂ imm., July, 1883; 1 ♀ ad., July, 1883; 1 ♂ ad., Oct., 1910; 1 ♀ ad., Oct., 1915; 1 ♂ ad., Nov., 1915; 1 ♀ ad., Nov., 1912; 1 ♂ ad., Dec.; 1 ♂ ad., Dec., 1883; 1 ♂ ad., Dec., 1884; 1 ♂ ad., Dec., 1911; 1 ♂ ad., Dec., 1913; 1 ♀ ad., Dec., 1882; 1 ♀ ad., Dec., 1911.

Range.—The Kurile Islands, north along the Kamtchatkan coast (not breeding) (Dybowski, 1882) and east, intergrading in the Komandorskie Islands; irregularly occurring on southern Sakhalin Island (Aniwa Bay). One specimen from St. Lawrence Island, Bering Sea, approaches this form.

Remarks.—Bergman (1935: 149) makes note of a specimen supposedly taken in Awatscha (= Avacha) Bay, Kamchatka. There is no date of collection given. The appearance of literature references to this species occurring in the main Japanese Islands are doubtful. One of the specimens examined has the locality Japan written on the label. It was collected by H. Pryer and is more than probable that it came from the Kuriles, which at that time were part of the Japanese Empire. Two specimens are recorded by Gizenko (1955: 101) from Nagasaki, Japan collected by Polyakov on February 14, 1883. As with the preceding specimen it is more than likely that these specimens came from elsewhere in the Japanese Empire. The Whiskered Auklet appears to have a definite affinity for a certain type of habitat. As pointed out in the discussion (see above), the bird is more or less selective for locations which have steep and rocky shores. To my knowledge no specimen has been taken from any area where these conditions do not prevail.

In the Hand-list of Japanese Birds (1942: 171) records are given for the islands of Hondo (= Honshu) and Shikoku. Austin and Kuroda (1953: 461) have traced the Hondo Island records. These represent two specimens taken by the Perry Expedition and identified by Cassin as *Uria mystacea* Pallas. Later the binominal he used was placed into the synonomy of the Whiskered Auklet. One of these specimens is now in the United States National Museum collection and is identified as *Aethia cristatella* (Pallas). The other Perry Expedition specimen has been lost and is believed to be *cristatella* by Austin and Kuroda. They could find no trace of the records from Shikoku Island. The most recent Hand-list of Japanese Birds (1958: 236) accepts the arguments of Austin and Kuroda for deleting the records for Japan. The Hand-list also cites a record for Honshiu (Miyagi-Vogel, No. 15: 31, 1957). This is the only record I know of from the islands of Japan. The status of this species in Japan is that of a very rare straggler, as the Hand-list states.

The records of the Whiskered Auklet from St. Lawrence Island are quite sparse, three being known. The only specimen I have examined, one in the U.S. Nat. Mus. collection, taken at Gambell in July, 1931, by a native, P. Silook, is an intermediate bird and shows a greater affinity to the Kurile population than to the Aleutian one. On the reverse side of the label is written ". . . never seen before." Friedmann (1932: 28) notes that Choris obtained several specimens from the natives of the island, and that Ridgway left the status of the bird there open to question. Dementiev (1951: 221) and Kozlova (1957: 135) list St. Lawrence Island as a breeding area. The scarcity of records from the locale, added to the fact that the bird was unknown to a native collector in 1931, suggests that this island is one rarely visited rather than a breeding ground.

SUMMARY

A study of the Whiskered Auklet, *Aethia pygmaea* (Gmelin), revealed a clinal distribution throughout its range. In measurements

the smaller end of the cline has its terminus in the Aleutian Islands, the larger end of the cline has its terminus in the Kurile Islands. The latter are also browner (less slaty black) than the Aleutian birds.

The specimens from the Komandorskie Islands (a breeding area) and from St. Lawrence Island are intermediate, being closer to the Kurile population.

The ends of the cline, being distinct in several morphological characters, may be called *Aethia pygmaea pygmaea* (Gmelin) and *Aethia pygmaea camstchatica* (Lepechin).

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PROCEEDINGS OF THE SEVENTY-SIXTH STATED MEETING OF THE AMERICAN ORNITHOLOGISTS' UNION

Seventy-fifth Anniversary Meeting

BY HAROLD MAYFIELD, SECRETARY

The Seventy-sixth Stated Meeting (seventy-fifth anniversary) of the American Ornithologists' Union was held from October 14 to 19, 1958, at the American Museum of Natural History, New York. Business sessions were held on October 14, papers sessions on October 15, 16, and 17, field trip to Long Island on October 18, and tour of the New York Zoo on October 19. Sponsoring organizations were the American Museum of Natural History, the Linnaean Society of New York, the National Audubon Society, and the New York Zoological Society.

Business Sessions

On October 14, the Council met throughout most of the day, the Fellows met late in the afternoon, and the Fellows and Elective Members met together in the evening. The Council held a second meeting in the evening of October 16.

1959 meeting. The Seventy-seventh Stated Meeting will be held from August 25 to 30, 1959, at Regina, Saskatchewan, by invitation of the Saskatchewan Museum of Natural History, the Saskatchewan Natural History Society, the Regina Natural History Society, and Regina College. This is the first A.O.U. meeting to be held in the Prairie provinces of Canada.

Tentatively consideration is being given to Ann Arbor, Michigan, as the site for the 1960 meeting, and Washington, D. C., for 1961.

Awards. The Brewster Memorial Award, by action of the Council, was presented to Arlie William Schorger for his scholarly and meticulous study of the extinct species—the Passenger Pigeon, whose dramatic disappearance from the earth focused attention on the great need for education and laws to protect nonrenewable resources. Dr. Schorger has made a valuable contribution to ornithology by his painstaking and exhaustive efforts to collect all available observations on this extinct species, through correspondence, interviewing and study of published records, and by reconstructing its life history, despite the existence of a large body of contradictory literature. His work is a fine example of the use of the historical method in ornithology. His study also presents the most accurate record we have of man's role in the incredible extinction of an abundant species in a short time. It cannot help but have an impact on the education of man for conservation of all living things, including himself.

Marcia B. Tucker Awards, assisting young ornithologists of promise to attend the annual meeting, were given by vote of the officers to J. William Hardy, University of Kansas; Fant W. Martin, Utah State University; Jared Verner, Louisiana State University; and Glen Woolfenden, University of Florida.

Patrons. The Council voted to inscribe the names of six members permanently in the rolls of the Union as Patrons in recognition of generous contributions to the organization: Alfred Gross (through a gift in his honor by Betty Carnes), Cyrus Mark, Roger T. Peterson, Herbert Stoddard, Mrs. Johnathan Dwight (posthumously), James Savage (posthumously).

Amendments to the By-laws. All of the amendments proposed in 1957 (except that dealing with Elective Members) were adopted. Those adopted follow:

Article I, Section 1. "The membership of the Union shall consist of the following classes: (1) Fellows, (2) Emeritus Fellows, (3) Honorary Fellows, (4) Corresponding Fellows, (5) Elective Members, (6) Members, (7) Honorary Members, and (8) Patrons." (Adds the class "Honorary Members.")

Article I, Section 2, second sentence. "They (the Fellows) shall be limited to fifty individuals of not more than sixty years of age, and this without prejudice to the number, status, or further election of older Fellows." (Formerly the age division was set at sixty-five years.)

Article I, Section 8. "Honorary Members shall be elected by the Council. To be eligible for the class of Honorary Member a person shall have performed meritorious service to the Union, to ornithology or to allied sciences which, in the opinion of the Council, merits this special recognition. If the person elected has been an Elective Member, he shall be designated an Honorary Elective Member." (This is a new section. It gives official status to a class previously recognized without sanction by the By-laws.)

Article IV, Section 3, paragraph 2: Eliminate the second sentence, which begins "During the first year. . . ." and insert instead the sentence, "A retiring Vice-president is not eligible for immediate re-election as Vice-president."

Article V, Section 1. "Annual dues will be paid by Fellows, Elective Members and Members. The amount of the annual dues will be set by the Council. No dues shall be required of Patrons, Honorary Fellows, Corresponding Fellows, Emeritus Fellows, or Honorary Members." (This removes the amount of dues from the By-laws and specifies the exempt classes.)

Article V, Section 5. "Fellows, Elective Members, and Members, not in arrears for dues, and Emeritus Fellows, Honorary Fellows, Corresponding Fellows, and Honorary Members shall receive the regular serial publication of the Union, entitled 'The Auk,' gratis." (This specifies which classes get "The Auk" free and implies that there may be special publications of the Union which do not go automatically to members of any class.)

Membership. The Secretary reported that 2930 copies of "The Auk" are being mailed; this mailing list includes all classes of members, subscriptions, and exchanges with other journals. The Treasurer's records showed members by classes before the elections in this meeting as follows:

Fellows	78
Fellows Emeriti	2
Honorary Fellows	19
Corresponding Fellows	67
Elective Members	197
Honorary Elective Members	5
Members	2,246
Student Members	38

Charles H. Blake, Chairman of the Membership Committee, reported by letter that twenty-five members, regionally located, were serving with his committee. He reported that as of September 24, 1958, the A.O.U. had enrolled 117 new members since the last annual report and had lost 141, a net loss of 24. He suggested that income from dues might be increased by creating a contributing membership with dues of $10 per year.

Finances. The report of the Treasurer appears in full elsewhere in "The Auk." The Treasurer's records were examined and found in order by the Auditing Committee (Hoyes Lloyd, Chairman; Herbert G. Deignan; James C. Greenway, Jr.).

The dues for all classes of members paying dues were set at $5 per year by vote of the Council, which had just been empowered to do so by amendment to the By-laws.

With the inclusion of gifts announced at the meeting—that is, after the close of the fiscal year on July 31—the Josselyn Van Tyne Memorial Fund for research in ornithology totalled more than $7000. The further growth of this fund is to be directed by Betty Carnes and Roger T. Peterson.

Stephen S. Gregory, Chairman of the Investing Trustees, reported

that the appraised value of the endowment holdings as of July 31, 1958, was $115,199. The additions by gifts during the year were $14,750, and the earnings were $3,725.

Betty Carnes, Chairman of the Endowment Committee, reported that this had been a good year for the Endowment Fund, with bequests from James Savage of $10,000 and (too late to be included in the fiscal year) from Mrs. Jonathan Dwight of $6250. In all, the gifts for the fiscal year ending July 31 and the gifts after that date but before the close of the annual meeting totalled more than $20,800. Of this amount, $1000 from Mrs. Carnes (to name Alfred Gross, Patron) and $500 from Roger T. Peterson were for the Josselyn Van Tyne Fund for ornithological research.

The Council voted to set aside $500 in each of the years, 1959, 1960, 1961, and 1962 toward the expenses of the International Ornithological Congress to be held in the United States in 1962.

Editorial Matters

The Editor, Eugene Eisenmann, indicated the policies by which he had been guided, and acknowledged the help he had had not only from the members of the editorial committee but from many other bird students. Almost all articles submitted, and most notes, have been sent to at least one other ornithologist for critical appraisal. As a result, a large proportion of papers are returned to authors with suggestions for some rewriting. The Editor has urged that even the most technical article should at the start express its scope and purpose and at the end summarize its results, in language understandable by the average working ornithologist. An effort has been made to reduce the interval between receipt of a paper and its acceptance or return to the author. There is now little backlog; a manuscript once deemed in shape for publication appears very soon. The Editor reminded the Council that when accepting election last year, he told the Council he would be unable to continue beyond a second year. Three numbers of volume 75 of "The Auk" have so far appeared in 1958; the fourth is in the press. The number of pages will be about the same as in volume 74 (not counting the membership list).

Joseph J. Hickey, Chairman of the *ad hoc* Committee on the Format of "The Auk," presented in letter a preliminary report. Other members of this committee are Frank Preston, George H. Lowery, Jr., and Robert W. Storer. The aim of this committee is to review various technical aspects (format, type-bed, etc.) of "The Auk," which has been unchanged for many years. There is hope that a new approach

might permit the publication of a larger journal without sacrifice of other desirable qualities. A number of scientific journals are being compared for this purpose.

The Editor of *The Handbook,* Ralph S. Palmer, reported that approximately 70 percent of the manuscript for loons through ducks is at hand. So far as the text is concerned, work on these lower orders remaining to be done falls into three categories: (1) material unassignable to others, which the editor is preparing as fast as circumstances permit; (2) assigned material now overdue, but which there is reason to expect will be done fairly soon; and (3) assignments on which authors procrastinated, then defaulted, long after the due date. The third category, especially, has slowed the overall schedule to a degree that seems unfair to the many authors who were prompt in fulfilling their commitments.

Reports of Committees.

W. J. Breckenridge, Chairman of the Committee on Biography, reported by letter that three memorials and two obituaries were published during the year ending with the April, 1958, issue. During the year ending October 14, 1958, the committee had been informed of the deaths of one Fellow, one Corresponding Fellow, two Elective Members, and two Members:

Oliver Austin, Sr., Elective Member, November, 1957
A. L. Bailey, Member, October 4, 1957
Logan J. Bennett, Elective Member, September 12, 1957
Claude Grant, Corresponding Fellow, January 9, 1958
James A. Munro, Fellow, September 29, 1958
Louis B. Thacher, Jr., Member, March 24, 1958

William H. Behle, Chairman of the Committee on Student Membership Awards, reported by letter that 38 students were named to receive "The Auk" free of charge for one year. With one exception that was appointed too late for inclusion in the list, the names of these Student Members were published in the January issue of "The Auk."

S. Charles Kendeigh reporting for Donald S. Farner, Chairman of the Committee on Research, recommended as follows:

(1) That there be established on a trial basis a Research Clinic whose function will be to assist isolated investigators and investigators who plan to begin research in fields in which they are unfamiliar with existing knowledge and methodology.

(2) That appropriate action be taken to further the development and publication of a "Glossary of Scientific Terms Used in Animal Behavior."

(3) That the A.O.U. sponsor a second volume of "Recent Studies in Avian Biology."

(4) That the Research Committee continue deliberations on a scheme for compiling and dispersing information on ornithological research *in progress* and unpublished theses at colleges and universities, and possibly other organizations.

(5) That the Research Committee explore the possibility of establishing a subject-finder list in *Biological Abstracts* such as has been developed for biochemistry and fisheries biology.

Ira N. Gabrielson presented the report of E. R. Kalmbach, Chairman of the Committee on Bird Protection. This report appears separately in full in "The Auk."

ELECTION OF OFFICERS

At the meeting of Fellows and Elective Members, Ernst Mayr was re-elected President, George H. Lowery, Jr., was advanced automatically to First Vice-president, Dean Amadon was elected Second Vice-president, Herbert G. Deignan was elected Secretary, and Charles G. Sibley was re-elected Treasurer.

Three men were elected to the Council, with terms expiring in 1961: Oliver Austin, Jr., Harold F. Mayfield, and L. L. Snyder.

Eugene Eisenmann was re-elected Editor of "The Auk" by action of the Council. The Council also re-elected the Investing Trustees, Stephen S. Gregory, Chairman; Clarence B. Randall; and A. W. Schorger. The complete list of officers and Council members appears at the end of the Proceedings.

ELECTION TO SPECIAL CLASSES OF MEMBERSHIP

The following people were elected to special classes of membership:

FELLOW

Andrew J. Berger, Ann Arbor, Michigan
William Pierce Brodkorb, Gainesville, Florida
Harold F. Mayfield, Waterville, Ohio

HONORARY FELLOW

William Homan Thorpe, Cambridge University, England.

CORRESPONDING FELLOW

D. S. Rabor, Silliman University, Philippine Islands
Franz Sauer, University of Freiburg/Breisgau, Germany
Ernst Sutter, Natural History Museum, Basel, Switzerland
Gunnar Svärdson, Institute for Fresh Water Research, Drottingholm, Sweden

ELECTIVE MEMBER

Fred H. Glenny, Akron, Ohio
Philip S. Humphrey, New Haven, Connecticut

Wesley E. Lanyon, New York, N. Y.
Margaret H. Mitchell, Toronto, Ontario
Thomas L. Quay, Raleigh, North Carolina
Dale A. Zimmerman, Imlay City, Michigan

ATTENDANCE

Registration at the meeting included 369 people from 34 states, the District of Columbia, 3 provinces of Canada, Belgian Congo, Colombia, Denmark, England, Finland, France, Germany, Greece, Iraq, Peru, Switzerland, and Venezuela, as follows:

Belgian Congo: A. F. DeBont. *Colombia:* José I. Borrero. *Denmark:* Finn Salomonsen. *England:* Mr. and Mrs. James D. Macdonald, Guy Mountfort, David Peakall. *Finland:* Lars von Haartman. *France:* Jean P. Dorst. *Germany:* Franz Sauer, Mr. and Mrs. Erwin Stresemann. *Greece:* George E. Watson. *Iraq:* Munir Bunni. *Peru:* Maria Koepcke. *Switzerland:* Ernest Sutter. *Venezuela:* Mr. and Mrs. William H. Phelps, Jr.

CANADA. *Ontario:* James L. Baillie, Bertram Fauvel, W. E. Godfrey, Mr. and Mrs. W. W. H. Gunn, Mr. and Mrs. Paul Hahn, Mr. and Mrs. L. E. Jaquith, Mr. and Mrs. Hoyes Lloyd, Mrs. Osborne S. Mitchell, George W. North, Mr. and Mrs. L. L. Snyder, Mrs. J. Murray Speirs, Barbara Stupart. *Quebec:* Mr. Justice, Mrs. G. H. Montgomery. *Saskatchewan:* Robert W. Nero.

UNITED STATES. *Alaska:* Brina Kessel. *Arizona:* Mr. and Mrs. Anders H. Anderson. *Arkansas:* Douglas James. *California:* Robert S. Arbib, Jr., Mrs. Enid K. Austin, George A. Bartholomew, Jr., Nicholas E. Collias, John Davis, Jean Delacour, Keith L. Dixon, Earle R. Greene, Thomas R. Howell, Robert C. Miller, Emily D. Smith, Kenneth E. Stager. *Connecticut:* E. A. Bergstrom, Leonard J. Bradley, Mary A. Heimerdinger, Mrs. Harold Hibbert, Mrs. Winthrop Hilding, Philip S. Humphrey, George E. Lippert, Halsey M. Marsden, Mr. and Mrs. Franklin McCamey, Charles E. Mohr, Mr. and Mrs. S. D. Ripley, R. M. Taylor, James L. Woodson. *Delaware:* Mr. and Mrs. Richard Herbert. *District of Columbia:* Rudyerd Boulton, Shirley A. Briggs, Herbert G. Deignan, Herbert Friedmann, Mr. and Mrs. Frederick C. Lincoln, Mrs. Louise Rehm, Virginia H. Russell, Dr. Wade, Mr. and Mrs. Alex Wetmore, Marguerite Young. *Florida:* Oliver L. Austin, Pierce Brodkorb, Allan D. Cruickshank, Joshua C. Dickinson, William B. Robertson, Jr., Wayne Short, John H. Storer, Glen E. Woolfenden. *Georgia:* Ray C. Werner. *Idaho:* Thomas A. Burleigh. *Illinois:* Mr. and Mrs. Ormsby Annan, Mrs. Amy G. Baldwin, Karl E. Bartel, W. J. Beecher, Walter Gillespie, Mr. and Mrs. Stephen S. Gregory, Charles S. Kendeigh, Mr. and Mrs. Cyrus Mark, Mrs. Margaret M. Nice, Mr. and Mrs. A. L. Rand, Max C. Shank, Mrs. Hermon D. Smith, Melvin Traylor, John Wanamaker, George C. West. Albert Wolfson. *Indiana:* Philip M. Kahl, Jr., Val Nolan, Jr., John M. Satter. *Kansas:* John Bowles, E. Raymond Hall, John W. Hardy, R. F. Johnston, Robert M. Mengel, Max Thompson. *Louisiana:* Mrs. H. C. Hearne, Mrs. Ethel D. Jones, Mrs. Electa D. Levi, Mr. and Mrs. George H. Lowery, Jr., Robert J. Newman, Ava R. Tabor, Jared Verner. *Maine:* Alfred O. Gross, Howard L. Mendall, Christopher M. Packard, Mr. and Mrs. Olin S. Pettingill, Jr., Mr. and Mrs. Burton Whitman. *Maryland:* David E. Davis, Allen J. Duvall, Sue Flick, D. A. Jones, James H. Lloyd, Brooke Meanley, Chandler S. Robbins, Eleanor Robbins, David K. Wetherbee.

Massachusetts: Aaron M. Bagg, R. H. Barth, Jr., L. M. Bartlett, **Walter Bock,** Frances L. Burnett, Richard T. Darby, Mr. and Mrs. William H. **Drury, Mrs.** Ruth P. Emery, James C. Greenway, Jr., Terrell Hamilton, **Carl W. Helms, John** Kieran, Mr. and Mrs. Ernst Mayr, Andrew Meyerriecks, I. C. T. Nisbet, **W. John** Smith, Wendell Taber. *Michigan:* H. L. Batts, Jr., William R. Dawson, **Robert J.** Grimm, Paul Slud, Peter Stettenheim, Mr. and Mrs. R. W. Storer, **Harrison B.** Tordoff, Mrs. J. Van Tyne, Mr. and Mrs. L. H. Walkinshaw, **George J. Wallace,** Leonard W. Wing, Richard Zusi. *North Carolina:* Knut Schmidt-Nielsen. ***Minnesota:*** Dwain W. Warner, Paul Petersen, Arnold Petersen, Mr. and Mrs. Whitney Eastman. *Nebraska:* William F. Rapp, Jr. *New Jersey:* **John A. Alderman,** Beecher S. Bowdish, Mrs. Herbert E. Carnes, Don Carter, **Dorothy M. Compton,** Robert Conn, Mrs. John Y. Dater, Frank Frazier, Jr., Mrs. **Gladys G. Fry, Mrs.** Richard Gambrill, Francis Harper, J. R. Jehl, George Komorowski, Mr. and Mrs. Robert W. Krebs, D. S. Lehrman, George W. Merck, Hubert H. Mill, **Bertram G.** Murray, Jr., Charles K. Nichols, Norman B. Pilling, Albert **Schnitzer, Eva F.** Schnitzer, Robert F. Seibert, Jeff Swinebroad, Mrs. Anne W. **Wachenfeld, Helen J.** Williams. *New York:* Helmut E. Adler, Arthur A. Allen, Irwin **M. Alperin,** Mr. and Mrs. Dean Amadon, Harold H. Axtell, John H. Baker, **Charles H. M. Barrett,** William Beebe, John A. Behnke, Stanley Belfore, Allen H. Benton, **Mrs. Albert R.** Brand, Mr. and Mrs. Winston William Brockner, Carl W. Buchheister, **Paul Buck**ley, Mr. and Mrs. John Bull, Robert Burnap, Victor Cahalane, **Geoffrey Carleton,** James P. Chapin, Roland C. Clement, Henry H. Collins, Jr., **William G. Conway,** Lee S. Crandall, Senator Thomas C. Desmond, Mr. and Mrs. **William C. Dilger,** Mr. and Mrs. Stephen Eaton, Don R. Eckelberry, Ruth C. Eisenhart, **Eugene Eisen**mann, Mrs. Orry R. Evans, E. J. Feinberg, Mr. and Mrs. Robert W. **Ficken, Devin** A. Garrity, Herman Goebel, Robert H. Grant, George M. **Happ, Richard E.** Harrison, James M. Hartshorne, Sally F. Hoyt, Lois J. Hussey, **Mrs. W. G. Irving,** E. R. P. Janvrin, Mrs. Brewster Jennings, Paul A. Johnsgard, **Herbert Johnson,** Peter P. Kellogg, Mr. and Mrs. Wesley Lanyon, Col. and Mrs. **Donald S. McChesney,** Mrs. Malcolm S. McIlroy, Pauline Messing, Harold D. Mitchell, **Joseph C. Moore,** Hemming Mortensen, Mr. and Mrs. Robert C. Murphy, **Theodora Nelson, John T.** Nichols, James R. Nolan, Ralph Palmer, Leslie Pearl, **Catherine Pessino, Richard** E. Phillips, Lucien Pohl, Peter Post, Mr. and Mrs. Richard Pough, **Bayard W.** Read, Edgar M. Reilly, Jr., Mrs. Eva Rich, James B. Ross, **Dorothy M. Sawyer,** Lester L. Short, Jr., Mr. and Mrs. Charles G. Sibley, Fred C. Sibley, **Arthur Singer,** Richard A. Sloss, Neal G. Smith, Eva Sobol, Walter R. Spofford, **Charles Staloff,** Margaret Stewart, Mrs. Dayton Stoner, Kenneth Taylor, Edwin Way **Teale, John** K. Terres, W. S. Terry, Mrs. Carll Tucker, Mr. and Mrs. **Charles Vaurie, Josh** Wallman, Ethel Warner, David West, Maxwell C. Wheat, Jr., Leroy **Wilcox, Hudson** S. Winn, Robert G. Wolk, Isabelle de Wyzewa. *Ohio:* **Robert D. Ball, James Bruce,** Mrs. Grant M. Cooke, Fred H. Glenny, Frank A. Hartman, **Harold Mayfield, Ken**neth L. Meyers, Mr. and Mrs. Harry C. Oberholser, **Warner Seely.** ***Oklahoma:*** Robert D. Burns. *Pennsylvania:* James Bond, Mrs. E. R. Bordner, **Dorothy Bord**ner, John A. Griswold, Jr., Frederick V. Hebard, John F. **McIlvain, John F.** Mehner, M. M. Nichols, Kenneth C. Parkes, Louis A. Stimson, **Phillips B. Street,** Elizabeth A. Taft, W. E. Clyde Todd, John E. Trainer, Mr. and **Mrs. Merrill** Wood. *Rhode Island:* James Baird. *South Carolina:* **John H. Dick, Alexander** Sprunt, Jr. *Tennessee:* Albert F. Ganier, J. C. Howell, **Mrs. Amelia R. Laskey,** James T. Tanner. *Texas:* Ernest P. Edwards, Edgar B. Kincaid, **Jr., Robert K.**

Selander, Col. L. R. Wolfe. *Utah:* Fant W. Martin. *Vermont:* Thomas Foster, Mrs. James R. Downs. *Virginia:* Ira N. Gabrielson, John W. Aldrich. *Wisconsin:* John T. Emlen, C. S. Jung, George B. Schaller, Mr. and Mrs. A. W. Schorger, Charles M. Weise. *Wyoming:* Oliver K. Scott.

PUBLIC SESSIONS

Papers sessions were held in the morning and afternoon of each of the three days beginning Wednesday, October 17, in the American Museum of Natural History. Sessions ran concurrently in two different rooms on Wednesday afternoon, Thursday morning, and Friday morning and afternoon.

WEDNESDAY MORNING SESSION

The meeting was opened by an address of welcome by William A. Burns, Assistant to the Director, American Museum of Natural History. Ernst Mayr, President of the American Ornithologists' Union, responded. Secretary, Harold F. Mayfield, summarized the results of the previous day's business sessions, including elections and awards.

The Breeding Cycle of Wideawake Fair. (Slides) JAMES P. CHAPIN, American Museum of Natural History, New York, New York, and L. W. WING, Ann Arbor, Michigan.

The Continental Pattern of Migration on the Night of October 3, 1952. (Slides) GEORGE H. LOWERY, JR., and ROBERT J. NEWMAN, Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana.

Salt Excretion by a Nasal Gland in Marine Birds. KNUT SCHMIDT-NIELSEN, Duke University, Durham, North Carolina.

What is a Tanager? (Slides) ROBERT W. STORER, Museum of Zoology, University of Michigan, Ann Arbor, Michigan.

The Nest and Behavior of the Sociable Weaverbird *(Philetaerus socius)* in South Africa. (Motion picture) NICHOLAS E. COLLIAS and ELSIE C. COLLIAS, Department of Zoology, University of California, Los Angeles, California.

WEDNESDAY AFTERNOON SESSIONS

(Session 2A—Concurrent)

The Breeding Grounds of the Eastern Dowitcher. W. E. CLYDE TODD, Carnegie Museum, Pittsburgh, Pennsylvania.

Occurrence of Dowitchers in Central Labrador in Summer. (Slides) ROLAND C. CLEMENT, National Audubon Society, New York, New York.

Present Status of the Avifauna of Clipperton Island. (Slides) KENNETH E. STAGER, Los Angeles County Museum, Los Angeles, California.

The Distribution of Birds on the Western Side of the Peruvian Andes. MARIA KOEPCKE, Museo de Historia Natural "Javier Prado," Lima, Peru.

Breeding Bird Populations of the Taiga and Tree Line in Northern Manitoba. (Slides) WALTER L. GILLESPIE, University of Illinois, Champaign, Illinois.

Origin and Distribution of the Carolina Chickadee. (Slides) RICHARD BREWER, University of Illinois, Champaign, Illinois.

Zoogeographical Anecdotes: Sclater and Wallace. BARBARA G. BEDDALL, 2502 Bronson Road, Fairfield, Connecticut.

Experiences Collecting Specimens of the Extinct Passenger Pigeon. (Slides) PAUL HAHN, 7 Lynwood Avenue, Toronto, Ontario.

Robin Populations and Insecticides. (Slides) JOHN F. MEHNER, 1526 Greenmont Avenue, Pittsburgh, Pennsylvania.

The Outlook for Florida's Wading Birds. JOHN H. STORER, Florida Audubon Society, Maitland, Florida.

(Session 2B—Concurrent)

The Ontogeny of Avoidance Behavior in the Common Grackle and in Gallinaceous Chicks. (Slides) GEORGE B. SCHALLER, Department of Zoology, University of Wisconsin, Madison, Wisconsin.

Agonistic Behavior of the Common Grackle. (Motion picture) ROBERT W. FICKEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.

Agonistic Behavior of the American Redstart in Relation to Territory. MILLICENT S. FICKEN, Laboratory of Ornithology, Cornell University, Ithaca, New York.

Behavior of the Bronzy Sunbird, *Nectarinia kilimensis*, in the Kivu District, Belgian Congo. (Slides) RUTH T. CHAPIN, The American Museum of Natural History, New York, New York.

Honey-Guides near Lake Kivu, Belgian Congo. (Slides) JAMES P. CHAPIN, The American Museum of Natural History, New York, New York.

Comparisons of the Displays of Eurasian Golden Plover and Dotterel. (Slides) WILLIAM H. DRURY, JR., Massachusetts Audubon Society, South Lincoln, Massachusetts.

Family Organization of the Canada Goose in Utah. (Slides) FANT W. MARTIN, Utah State University, Logan, Utah.

Nest Material Carrying Behavior of Hybrids Between *Agapornis roseicollis* and *A. fischeri*. (Motion picture) WILLIAM C. DILGER, Laboratory of Ornithology, Cornell University, Ithaca, New York.

Territory and Competition between Sunbird and Honey-eater Species in the Moluccas. (Slides) S. DILLON RIPLEY, Peabody Museum of Natural History, Yale University, New Haven, Connecticut.

THURSDAY MORNING SESSIONS

(Session 3A—Concurrent)

Studies on the Morphology of the Avian Pulmonary System. (Slides) J. D. MACDONALD and G. S. COWLES, British Museum (Natural History), London.

Climbing Adaptations and the Classification of the Woodpeckers. (Slides) WALTER J. BOCK, Biological Laboratories, Harvard University, Cambridge, Massachusetts.

Divergent Adaptations for Gaping in Passerine Birds. (Slides) RICHARD L. ZUSI, Department of Zoology, University of Maine, Orono, Maine.

A Pleistocene Avifauna from Rock Spring, Florida. (Slides) GLEN E. WOOLFENDEN, Department of Biology, University of Florida, Gainesville, Florida.

The Pleistocene Avifauna of Arredondo, Florida. (Slides) PIERCE BRODKORB, Department of Biology, University of Florida, Gainesville, Florida.

Specific and Individual Variation in Reduction of the Clavicles in Parrots. FRED H. GLENNY, Youngstown College, Youngstown, Ohio.

Seasonal Variation in the Energy Balance of the Tree Sparrow. (Slides) GEORGE C. WEST, University of Illinois, Champaign, Illinois.

Differences between Resident and Migrant Species in Response to Rising Temperatures in the Spring. (Slides) S. CHARLES KENDEIGH, University of Illinois, Champaign, Illinois.

(Session 3B—Concurrent)

Studies on the Andean Solitaire, *Myadestes ralloides*. (Slides) GEORGE J. WALLACE, Department of Zoology, Michigan State University, East Lansing, Michigan.

Nesting of the Western Flycatcher. (Slides) JOHN DAVIS, Hastings Natural History Reservation, University of California, Carmel Valley, California.

Nesting Behavior of the Red-footed Booby. (Slides) JARED VERNER, Museum of Zoology, Louisiana State University, Baton Rouge, Louisiana.

How to Calculate the Incubation Period. (Slides) LARS VON HAARTMAN, University of Helsingfors, Finland.

Birds as Hosts of Arthropod-borne Viruses. R. M. TAYLOR, Yale University School of Medicine, New Haven, Connecticut.

The Age Composition of Migrant and Resident Starlings. DAVID E. DAVIS, The Johns Hopkins University, Baltimore, Maryland.

Are Flying Birds Affected by Radar? (Slides) ROBERT C. MILLER, California Academy of Sciences, San Francisco, California.

The Brown-headed Cowbird and the Kirtland's Warbler. (Slides) HAROLD F. MAYFIELD, Waterville, Ohio.

THURSDAY AFTERNOON SESSION

*Symposium on Contemporary Problems in Ornithology**

Systematics. ERWIN STRESEMANN, Berlin, Germany.

Zoogeography. FINN SALOMONSEN, Zoologiske Museum, Copenhagen, Denmark.

Orientation and Migration. FRANZ SAUER, Zoologischen Institut der Universität Freiburg/Breisgau, Germany.

Studies on Nocturnal Migration by Radar. ERNST SUTTER, Naturhistorisches Museum, Basel, Switzerland.

FRIDAY MORNING SESSIONS

(Session 5A—Concurrent)

Discontinuous Morphism in Mexican Brown Jays. (Slides) ROBERT K. SELANDER, Department of Zoology, University of Texas, Austin, Texas.

Taxonomic Relationships of the Genera *Cyanocitta* and *Aphelocoma*. JOHN W. HARDY, Museum of Natural History, University of Kansas, Lawrence, Kansas.

Relationships of Ground Doves. (Slides) RICHARD F. JOHNSTON, University of Kansas, Lawrence, Kansas.

Migration, Melanic Tendencies and Molt in the Genus *Progne*. (Slides) EUGENE EISENMANN, American Museum of Natural History, New York, New York.

(Session 5B—Concurrent)

The Golden Eagle in the Appalachians. (Motion picture) WALTER R. SPOFFORD, State University Medical College, Syracuse, New York.

The Whooping Crane. (Motion picture) FREDERICK C. LINCOLN, U. S. Fish and Wildlife Service, Washington, D. C.

* Made possible by a contribution from the National Science Foundation.

A Problem in Generic Discrimination. (Slides) DEAN AMADON, American Museum of Natural History, New York, New York.

The Relationships of Certain Birds as Indicated by the Egg White Proteins. (Slides) CHARLES G. SIBLEY, Department of Conservation, Cornell University, Ithaca, New York.

Flamingos on Four Continents. (Motion picture) ROGER T. PETERSON, Old Lyme, Connecticut.

FRIDAY AFTERNOON SESSIONS

(Session 6A—Concurrent)

First Photographs of Bachman's Warbler. (Slides) JOHN H. DICK and ALEXANDER SPRUNT, JR., Charleston, South Carolina.

Comparative Studies on the North American Mallards. (Slides) PAUL A. JOHNSGARD, Department of Conservation, Cornell University, Ithaca, New York.

Hybridization of Buntings *(Passerina)* in the Great Plains. (Slides) CHARLES G. SIBLEY and LESTER L. SHORT, JR., Department of Conservation, Cornell University, Ithaca, New York.

The Bobwhite Quail as an Indicator of Biogeographic Events in Mexico. (Slides) DWAIN W. WARNER, Minnesota Museum of Natural History, University of Minnesota, Minneapolis, Minnesota.

The Avifauna of Scrub Vegetation of the Chihuahuan Desert. (Slides) KEITH L. DIXON, Hastings Natural History Reservation, University of California, Carmel Valley, California.

Biotic Provinces as Applied to Birds. (Slides) ROBERT M. MENGEL, Museum of Natural History, University of Kansas, Lawrence, Kansas.

Trends of Intraspecific Variation in Wing Length in *Vireo* and Other New World Species. (Slides) TERRELL HAMILTON, Biological Laboratories, Harvard University, Cambridge, Massachusetts.

Winter Bird Populations in a Nebraska River-Bottom Forest. (Slides) WILLIAM F. RAPP, JR., 430 Ivy Avenue, Crete, Nebraska.

The Severe Winter of 1957-1958 and Bird Populations the Following Spring at Knoxville, Tennessee. JOSEPH C. HOWELL, Department of Zoology, University of Tennessee, Knoxville, Tennessee.

(Session 6B—Concurrent)

Effect of Constant Short Day Lengths on Migratory Behavior. (Slides) ALBERT WOLFSON, Cresap Laboratories, Northwestern University, Evanston, Illinois.

Photoperiodic Regulation of the Gonadal Cycle in Hermit Thrushes. (Slides) ORMSBY ANNAN, Northwestern University, Evanston, Illinois.

Experiments on the Relationship Between Molt and Refractory Period in Juncos. (Slides) CHARLES M. WEISE, Department of Zoology, University of Wisconsin-Milwaukee, Milwaukee, Wisconsin.

The Effect of Temperature on the Egg-laying Date of Birds. (Slides) JAMES T. TANNER, Department of Zoology, University of Tennessee, Knoxville, Tennessee.

The Effect of Stimulation by the Mate and by Nesting Material on the Development of Broodiness and of the Reproductive Organs in the Ring Dove. (Slides) DANIEL S. LEHRMAN, Rutgers University, Newark, New Jersey.

Sea Water and Salt Utilization by Savanna Sparrows. (Slides) GEORGE A. BAR-

THOLOMEW and TOM J. CADE, Department of Zoology, University of California, Los Angeles, California.

Effects of Temperature on Energy Metabolism of the Evening Grosbeak. (Slides) WILLIAM R. DAWSON, Department of Zoology, University of Michigan, Ann Arbor, Michigan.

Further Experiments on Torpidity in the Poorwill. (Slides) THOMAS R. HOWELL and GEORGE A. BARTHOLOMEW, Department of Zoology, University of California, Los Angeles, California.

SOCIAL EVENTS

A reception, followed by dinner for Fellows and Council members, was held in the Audubon Art Gallery of the Museum on October 14. Movies were shown in the New Orleans Room, Hotel New Yorker.

A reception and open house, sponsored by the President of the A.O.U. and the Museum, was held in the Department of Birds at the Museum, on Wednesday, October 15.

On Thursday afternoon, October 16, a behind-the-scenes tour and sky-show was conducted at Hayden Planetarium for wives of members.

A reception and open house at the National Audubon Society was held on Thursday evening, October 16. Included was a special exhibit of Fuertes pictures.

The Annual Banquet was held on Friday, October 17, in the Terrace Room, Hotel New Yorker. Warm congratulatory addresses on the Seventy-fifth Anniversary of the American Ornithologists' Union were delivered by Guy Mountfort of Great Britain, Finn Salomonsen of Denmark, and Erwin Stresemann of Germany on behalf of the ornithologists of their respective countries. Letters or telegrams of congratulations were read from ornithologists and ornithological organizations in this country and from the British Ornithologists' Union and the Leningrad ornithologists. Those attending the banquet received a print of Audubon's "Hutchins's Barnacle Goose, *Anser Hutchinsii,*" specially struck from the original copper plate engraving for the Elephant Folio, owned by the American Museum of Natural History. The festivities included an address, "American Ornithology in 1958" by Ernst Mayr, a film, "Some North American Warblers" by C. B. Schaughency, and the award of the Brewster medal. John Kieran acted as toastmaster.

FIELD TRIPS

On Saturday, October 18, visitors were taken on an all-day field trip to Riis Park and Jamaica Bay Sanctuary on Long Island. On Sunday, October 19, a luncheon was held at the New York Zoo, followed by escorted tour of the Zoo.

RESOLUTIONS

The following resolutions were submitted by the Resolutions Committee (Phillips B. Street, Chairman; L. L. Snyder; and Kenneth E. Stager) and approved by the General Session on October 15, 1958.

RESOLVED, that the American Ornithologists' Union, holding its 75th Anniversary Meeting in New York, express its gratification to the State of New York for its recent enactment of a law giving adequate protection to the birds of prey.

RESOLVED, that the American Ornithologists' Union commends heartily the Department of the Interior through its Bureau of Sport Fisheries and Wildlife, for its work towards the protection of certain endangered species of birds, chiefly the Whooping Crane, the Laysan Teal and the Hawaiian Goose. It also commends the Secretary of the Interior for his forthright actions in protecting the primary values of the National Wildlife Refuges.

RESOLVED, that the American Ornithologists' Union strongly condemns the widespread use of extremely toxic pesticides for the control of insects or other pests, especially those that are known to be exceedingly stable compounds. We commend the 85th Congress for appropriating funds to make a scientific investigation of the effect of these compounds upon other forms of life and call upon all official agencies to limit spraying of local test areas until the results of these investigations can be evaluated. And be it further resolved that copies of this resolution be forwarded to the Secretary of Agriculture, the Secretary of the Interior, and the Chairman of the House and Senate Appropriations Committees.

RESOLVED, that the American Ornithologists' Union, here assembled in New York City for its 75th Anniversary Meeting, express its grateful appreciation to the host organizations—the American Museum of Natural History, the Linnaean Society of New York, the National Audubon Society and the New York Zoological Society, and to Dr. Dean Amadon, Chairman of the Local Committee on Arrangements, and his hard-working assistants, Wesley E. Lanyon, Charles Vaurie, Mrs. B. Brewster Jennings, Mrs. Carll Tucker, Carl Buchheister, John L. Bull, Paul A. Buckley, Geoffrey Carleton, William G. Conway, E. Thomas Gilliard, Herbert E. Johnson, John Kieran, Robert Cushman Murphy and Charles E. O'Brien, whose combined efforts have made this meeting a memorable occasion.

Also, the Council instructed the Secretary to write the President of the Massachusetts Audubon Society commending that organization for its action in acquiring and continuing the Austin Banding Station at South Wellfleet, Massachusetts.

OFFICERS AND TRUSTEES OF THE AMERICAN ORNITHOLOGISTS' UNION

	Expiration of Term
Ernst Mayr, *President*	1959
George H. Lowery, Jr., *First Vice-President*	1959
Dean Amadon, *Second Vice-President*	1959
Herbert G. Deignan, *Secretary*	1959
Charles G. Sibley, *Treasurer*	1959
Eugene Eisenmann, *Editor of "The Auk"*	1959

ELECTIVE MEMBERS OF THE COUNCIL

Donald S. Farner	1959
Thomas R. Howell	1959
Ralph S. Palmer	1959
John T. Emlen, Jr.	1960
Eugene Eisenmann	1960
Olin Sewall Pettingill, Jr.	1960
Oliver Austin, Jr.	1961
Harold F. Mayfield	1961
L. L. Snyder	1961
Cooper Ornithological Society Representative	1959
Wilson Ornithological Society Representative	1959

James P. Chapin, 1939-42	Ex-Presidents
Herbert Friedmann, 1937-39	
Ludlow Griscom, 1956	
Hoyes Lloyd, 1945-48	
Alden H. Miller, 1953-56	
Robert Cushman Murphy, 1948-50	
Alexander Wetmore, 1926-29	

INVESTING TRUSTEES

	Expiration of Term
Stephen S. Gregory	1959
Clarence B. Randall	1959
A. W. Schorger	1959

Annual Meeting of Cooper Ornithological Society

The annual meeting of the Cooper Ornithological Society will be held at Berkeley, California, April 3-5, 1959. It will be sponsored by the University of California and its Museum of Vertebrate Zoology.

TREASURER'S REPORT FOR THE PERIOD AUGUST 1, 1957–JULY 31, 1958

Income to Active Fund Account

Dues		
Fellows	$ 296.00	
Elective members	865.00	
Members	8,416.26	$ 9,577.26
Subscriptions		1,770.87
Sale of back issues of The Auk		296.95
Royalties on microfilms of The Auk		2.31
Royalties on sales of Recent Studies		278.19
Miscellaneous sales		159.29
Advertising		357.75
Donations to Active Publication Fund		317.00
Committee on Arrangements, Cape May Meeting, 1957		136.31
Income from:		
General Endowment Fund		2,066.41
Ruthven Deane Fund		311.68
Interest — Savings Account — 1957–58		427.71
Bank Refund		.29
Balance in Active Account, 1957		2,730.47
Total Income, 1958		$18,432.49

Special Funds

Brewster Memorial Fund		
Income from investments	$ 504.35	
Cost of 1957 medal		$ 23.33
To Robert P. Allen		481.02
	$ 504.35	$ 504.35
Bird Protection Endowment Fund		
Balance forward	$ 109.06	
Income from investments	63.99	
Donation to the International Union for the Protection of Nature and Natural Resources		$ 50.00
Donation to the International Committee for Bird Preservation		25.00
Donation to the International Wildfowl Research Bureau		25.00
Balance in Account		73.05
	$ 173.05	$ 173.05

Educational Endowment Fund		
Balance forward	$ 90.69	
Income from investments	258.43	
To William H. Behle (reimbursement)		$ 7.33
37 Student Members, 1958		148.00
Balance in Account		193.79
	$ 349.12	$ 349.12
Special Publication Fund		
Balance forward	$12,371.81	
Received from sale of Check-lists	17,975.63	
Printing, postage, etc.		$16,280.87
Transferred to Handbook Fund		500.00
Balance in Account		13,566.57
	$30,347.44	$30,347.44
Endowment Fund		
Balance in uninvested funds, 1957	$ 74.71	
Life Membership payments	1,671.00	
Patron payments	3,300.00	
From the Estate of James Savage	10,000.00	
Donations	202.00	
To Investing Trustees		$14,750.00
Balance in Account		497.71
	$15,247.71	$15,247.71
Research Book Fund		
Balance forward	$ 25.85	
Book sales	75.00	
Transferred to Special Publication Fund		$ 100.85
	$ 100.85	$ 100.85
Handbook of North American Birds Fund		
Balance forward	$ 2,273.23	
Donations	690.00	
Transferred from Special Publication Fund	500.00	
Supplies		$ 15.80
Balance in Account		3,447.43
	$ 3,463.23	$ 3,463.23
Marcia B. Tucker Fund		
Balance forward	$ 151.86	
Donation for 1958 Awards	500.00	
John William Hardy		$ 150.00
Fant W. Martin		200.00
Jared Verner		200.00
Glen E. Woolfenden		100.00
Balance in Account		1.86
	$ 651.86	$ 651.86

Van Tyne Memorial Fund		
Balance forward	$ 683.40	
Received for investment	5,016.00	
Balance in Account		$ 5,699.40
	$ 5,699.40	$ 5,699.40
National Science Foundation Grant No. 5278		
Received from Foundation	$ 2,800.00	
Balance in Account		$ 2,800.00
	$ 2,800.00	$ 2,800.00

DISBURSEMENTS

Manufacture and distribution of The Auk	$12,824.78
Reprints from The Auk for the A.O.U.	19.17
Editor's Expense	344.13
Secretary's Expense	186.56
Treasurer's Expense	182.71
Salary — Treasurer's Assistant	1,000.00
Mailing of back issues and other publications	420.69
Addressing service and supplies	192.47
Stationery, labels, etc.	82.81
Telephone and telegraph	4.13
Cost of dues notices	132.60
Preparation of Membership Roster	188.80
Membership Committee Expenses	52.51
Affiliation Fee, A.I.B.S. (1957 and 1958)	200.00
Donation, Zoological Society of London	50.00
Donation, International Committee on Zoological Nomenclature	10.00
Donation, British Ornithologists' Union	50.00
TOTAL EXPENDED, 1958	$15,941.36

TOTAL INCOME, 1958	$18,432.49	
Balance in Active Account, 1958	$ 2,491.13	
Balance in Bird Protection End. Fund	73.05	
Balance in Educational End. Fund	193.79	
Balance in Special Publication Fund	13,566.57	
Balance in Endowment Fund	497.71	
Balance in Handbook Fund	3,447.43	
Balance in Tucker Fund	1.86	
Balance in Van Tyne Fund	5,699.40	
Balance in N.S.F. Grant No. 5278	2,800.00	
	$28,770.94	
Savings Account, First National Bank, Ithaca, N. Y.		$18,070.49
Checking Account, First National Bank, Ithaca, N. Y.		$10,700.45
		$28,770.94

CHARLES G. SIBLEY, *Treasurer*

REPORT TO THE AMERICAN ORNITHOLOGISTS' UNION BY THE COMMITTEE ON BIRD PROTECTION, 1958

On the world-wide scene we find that the 11th International Committee for Bird Preservation was held in Helsinki, Finland, June 1-5, 1958 and was attended by representatives of 20 national sections, 4 international organizations, and an observer from the USSR. A new office, that of President-Emeritus, was created, and it is most gratifying to announce that a distinguished member of the A. O. U. and of this Committee, Dr. Jean Delacour, was elected as its first incumbent. Prior to the Helsinki conference, a meeting of the Executive Board of the International Wildfowl Research Bureau was held in southern France. The Nene Goose of Hawaii, the Brent Goose of Europe and the Laysan Teal were topics of discussion. The effect of airplane dispersal of pesticides, the establishment of reserves for species in danger of extinction, the need for better protection of birds of prey, the White Stork, the Brent Goose and the Great Indian Bustard, as well as control of the Herring Gull where too abundant, were subjects of consideration. The United States, conspicuous because of its failure to sign the International Convention of the Pollution of the Sea by Oil, 1954, was the subject of a resolution passed by the Helsinki conference. This "urgently recommended" that the United States join other maritime nations in signing and ratifying this convention.

In the United States the 85th Congress made commendable contributions to conservation legislation, much of which will have a bearing on the welfare of birdlife. Increase in the cost of the "duck stamp" from $2.00 to $3.00 and other related legislation will now permit the allocation of larger sums for the acquisition of wetlands so essential for the perpetuation of waterfowl in North America. With specific limitations on the use to which these funds may be put, there is now assurance that the acquisition of refuge lands may proceed at a rate that will permit, in about 25 years, the attainment of the goal set.

Amendment of the Coordination Act materially strengthens the consideration given wildlife in connection with water development projects under Federal construction. Of utmost importance to the welfare of birdlife was the enactment of legislation providing for adequate research in the dispersal of pesticides, a subject mentioned later in this report. Along with many others, your Committee chairman contributed a letter to the published hearings of the Senate Committee which considered and acted favorably on this legislation. Another measure directly affecting a threatened species gave authority

to the Department of the Interior to provide a program for the restoration and management of the Nene Goose in Hawaii. The creation of a National Wildlife Refuge for the protection of the unique and rare Key deer on the Florida Keys will be as gratifying to ornithologists as to mammalogists and conservationists generally.

Two administrative decisions by the Department of the Interior have important bearing on the welfare of birds. Regulations issued early in 1958 would permit drilling for oil or gas on national wildlife refuges *only* when operations on contiguous areas would result in the loss of these resources to the United States. It was made clear that the primary function of Federal wildlife lands is to preserve wildlife and its habitat. At the Tule Lake National Wildlife Refuge in northern California, threatened by encroaching agriculture, an order was issued asserting that the area must be used to protect fully the waterfowl resources.

A matter gratifying to your Committee and, we feel, to the membership generally was a decision made by a large industrial corporation "not to run any more ads on the theme of predator control." This was decided after your Committee and others had called attention to the possible harmful effects of such propaganda when directed against certain predatory birds. The action by this corporation is in conformity with progressive advertising, which, increasingly, is emphasizing sound conservation.

At the time of this writing reports from Canada indicate that at least three young Whooping Cranes were produced in the wild this season. One additional young was raised in captivity at the New Orleans Zoo. Consequently, if we may assume that there were no losses among the wild adults during the spring and summer, the total number of Whooping Cranes now stands at 35.

Through the kindness of Dr. F. C. Lincoln of the Fish and Wildlife Service your committee has the privilege of quoting the following paragraph of a paper he prepared for presentation at the meeting of the International Union for the Conservation of Nature held at Athens, Greece during this fall. It concerns species whose existence is considered precarious.

"These include the Greater Prairie Chicken *(Tympanuchus cupido cupido),* Attwater's Prairie Chicken *(T. c. attwateri)* and the Lesser Prairie Chicken *(T. pallidicinctus).* The continued existence of these prairie grouse is threatened because of habitat destruction due to agricultural expansion. All known California Condors *(Gymnogyps californicus)* are on the Los Padres National Forest where they are jealously guarded by the U. S. Forest Service and the State of California. They are, however, extremely vulnerable and, although no

late reports are available, it was estimated, in 1953, that there might be 60 in existence. As a result of a hurricane some ten or twelve years ago, it was thought that the Cape Sable Seaside Sparrow *(Ammospiza maritima),* found only in extreme southern Florida, had been exterminated. Information was received by the Fish and Wildlife Service within the last year that this bird had been rediscovered at a point on the west coast of southern Florida. No estimate has been made of the number present in this new locality. Each of the three kites is considered to be in a rather precarious situation—most concern being felt for the Everglade Kite *(Rostrhamus sociabilis),* whose habitat is being threatened by drainage and agricultural exploitation. They are, of course, being given full protection on the Loxahatchee National Wildlife Refuge near Palm Beach. The Puerto Rican Parrot *(Amazona vittata)* is found only in the Caribbean National Forest on the Island of Puerto Rico. A report received this year indicates that there are about 200 of these birds."

Results of the waterfowl breeding ground surveys in Canada show no major changes in the populations of the commoner species in 1958, but the decline in water levels is continuing and may be expected to have an adverse effect on the canvasback and redhead particularly. The status of the pond ducks remains satisfactory, except in the Atlantic Flyway. Regulations governing the take of waterfowl remain essentially the same except in Saskatchewan where the bag limit was reduced by 20 percent and the taking of canvasback and redhead has been further restricted. The numbers of Black Brant have continued to decline.

From Illinois comes a sad and disturbing report that the Greater Prairie Chicken population of that State has slipped badly over the past twenty years. Dr. Yeatter states that, in 1957 he was able to count only 23 male birds, whereas in 1938 he recorded 131 males in the same area. Similarly, twenty years ago this colony occupied at least 18 square miles; today, all the birds were in a single square mile.

Field studies by the Fish and Wildlife Service of the "gooneys" (albatrosses) of Midway Island as hazards to aviation were terminated in July, 1958. During the past year the approach was to continue basic biological studies of the two species of albatrosses *(Diomedea immutabilis* and *D. nigripes);* to observe the results of the elimination of segments of the albatross population by killing those nesting individuals and "unemployed" birds along the operational runways; and to make further observations on the relationship between unevenness of the ground surface and the incidence of soaring albatrosses. The conclusions reached were that (1) killing up to 30,000 *(sic)* albatrosses

in the vicinity of the runways did not significantly change the number of birds in the air over the runways and thus will not alleviate the hazard to aircraft; and (2) that leveling of the land will, very greatly, reduce the amount of soaring of albatrosses and, to that extent, decrease the number of birds in the air over that area.

To that end a definite recommendation was made that the land be leveled for 750 feet on each side of the operational runways. The Department of the Navy has indicated that it would carry out this recommendation beginning with the current fiscal year and to the extent that available funds will permit. After this has been done further observations will be made by the Fish and Wildlife Service to appraise the ultimate results. The Service published a summary of the earlier (1956-57) studies as Special Scientific Report—Wildlife No. 38 in January 1958.

During the year concern over the effects on wildlife of the airplane dispersal of highly toxic pesticides, particularly the chlorinated hydrocarbons, has reached an all-time high. The accumulating evidence has become so convincing that the Congress passed, without significant opposition, legislation authorizing and directing the Secretary of the Interior "to undertake comprehensive continuing studies on the effects of insecticides, herbicides and fungicides upon the fish and wildlife resources of the United States, * * *." To carry out the objectives of this Act the sum of $280,000 was authorized and, to hasten action, $125,000 was actually appropriated for use in the current fiscal year. (Parenthetically, let it be known that the same Congress appropriated $2,500,000 [the same as last year] for continuation of the controversial imported fire ant control program in Southern States.)

To recite all the evidence accumulating with respect to the effects of airplane dispersal of these insecticides would make this report unduly long. Reference to some of the published testimony seems desirable so that members of the Union may follow through with their reading.

Under date of May 25, 1958 the Bureau of Sport Fisheries and Wildlife released a summary of its available information. It was pointed out that the Department of Agriculture was advised of the Bureau's concern and, in December 1957, arrangements were made for exchange of information through liaison representatives. At the same time studies of the effects of the eradication upon wildlife were initiated by the Bureau. This work was augmented through research contracts with Louisiana State University and Alabama Polytechnic Institute and through cooperation with the Texas Game and Fish Commission.

Whereas the effects on wildlife in several southern areas showed losses of birds and small mammals as an immediate consequence of the fire ant control operations, the long-time effects could not be revealed for months. Bird numbers in the two most extensively studied areas were reduced 75-85 percent and in one Texas county the dead specimens found actually amounted to 33 percent of the pre-treatment population.

Another highly informative document released by the Fish and Wildlife Service in December 1957, entitled "Pesticides and Wildlife," was authored by Lucille F. Stickel and Paul F. Springer and appeared as Wildlife Leaflet 392. The subject matter is handled in a direct, question-and-answer manner based on the information available at the time. Supplementing it is a 14-title bibliography of pertinent literature.

An earlier paper by Springer, "Insecticides, Boon or Bane," was published in the Audubon Magazine, May-June and July-August, 1956. It contains a wealth of information on currently used insecticides.

And for those in search of toxicological information on this subject, two papers by James B. DeWitt on the effect of chlorinated hydrocarbons on quail and pheasants will fill their needs. They appeared in 1955 and 1956 in Agricultural and Food Chemistry.

Throughout the Middle-west the extensive use of DDT for the control of vectors of the Dutch elm disease is causing increasing concern since some of the long-time effects of this treatment are beginning to show up. Roy J. Barker, in carefully compiled "Notes on Some Effects of DDT—Sprayed on Elms" (Jour. Wildlife Mgt., 22: 3: 269–274, 1958) revealed the ultimate toxicity to robins (and presumably to other birds) of earthworms obtained in DDT-treated areas. Barker, formerly with the Illinois Natural History Survey and now with the Entomology Research Division of the U. S. Department of Agriculture, concludes his discussion with the statement that "the meager data available emphasize that biological effects of toxic chemicals or isotopes cannot be assessed in a few weeks following application."

Field observation of the lethal DDT-earthworm-robin sequence also has been made on the campus of Michigan State University where Dr. George J. Wallace witnessed death and the progressive reduction of the number of breeding robins through their having fed on poisoned earthworms. Still another earthworm-bird complex has been revealed in Louisiana where Federal and State investigators have recorded a marked reduction in earthworm numbers in areas

treated with heptachlor, a chlorinated hydrocarbon used in fire ant control. There, on the principal wintering grounds of the woodcock, this bird may become the victim of either food scarcity or food toxicity through feeding on poisoned earthworms. For a species whose continued existence is the concern of many people, this course of events may prove tragic.

No one familiar with conditions in the area now infested by the imported fire ant, will question the desirability of remedial action of some kind. Though convincing evidence is still lacking, Herbert L. Stoddard, America's foremost authority on quail management in the Southeast, is "very apprehensive that the imported fire ant will prove to be as destructive, or more so (to ground-nesting birds), than we found the native fire ant to be." Faced with such a dilemma, it is highly important that we expedite to the utmost comprehensive research. With airplane dispersal of insecticides proceeding apace, the opportunities to witness and appraise the effects of actual control operations are unexcelled. Hastening and intensifying the investigative program provided by recent legislation is now the most pressing and sensible approach. In facing this problem it must be realized that we are dealing with an accomplished fact. Much as we may object to the action that has been taken in the fire ant program, tearing of the hair and name-calling will avail little.

As a final word on this subject, your chairman wishes to add the following.

"Eradication" is a convincing, appealing and hopeful word. Applying it to the imported fire ant program means nothing less than destruction or removal of the last individual ant having reproductive potential. True it is there have been notable cases of insect control involving complete extermination in specified areas. However, with the exception of the removal of the Argentine ant from several towns in Mississippi, no species of ant has been emphatically suppressed (not to mention completely eradicated) over areas as great as that now occupied by the imported fire ant ("Can Insects be Eradicated?" Yearbook, U.S.D.A., 1952, pp. 197–199). It would appear, therefore, that the word "control" would be more realistic and realizable, though less effective, it must be admitted, for promotional purposes.

Submitted, September 3, 1958.

E. R. Kalmbach, *Chairman*
Jean Delacour
Ira N. Gabrielson
Robert A. McCabe
David A. Munro

GENERAL NOTES

Thick-billed Kingbird in the United States.—While on a field trip, June 4, 1958 to the Guadalupe Mountains of southeastern Arizona, adjacent New Mexico and Sonora, my brother John and I located two pairs of Thick-billed Kingbirds *(Tyrannus crassirostris)*—a species new to the A.O.U. Check-list area. The first pair was found in the Arizona portion of Guadalupe Canyon about one mile from the New Mexico border and five miles from the Sonoran border. The female was collected and proved to be in breeding condition. The bird contained a fully developed egg, the shell calcified when exposed to the air. Three other ova measured about 6 mm. each. The pair no doubt had a nest in one of the large cottonwoods or sycamores in the vicinity. The second pair, found in the same canyon less than a mile into Sonora from the International Border, was observed at their nest. The nest was built about 30 feet up in a large sycamore, in a crotch formed where a small lateral branch joined the main trunk. The birds appeared to be incubating and were constantly at the nest.

These Thick-billed Kingbirds shared their riparian habitat with nesting Western Kingbirds *(Tyrannus verticalis)* and Cassin's Kingbirds *(Tyrannus vociferans)*.

This species has been known hitherto only from western Mexico and Guatemala. The closest to the United States it has been found before is a breeding population at Rancho la Arizona, Sonora, Mexico, about 25 miles southwest of Nogales near the headwaters of the Rio Altar. Dr. Allan R. Phillips has a specimen from Huachinera, Sonora and one of a pair from Rancho Coyote, about 14 miles by road north and west from Bacadehuachi. It also breeds northeast of Imuris, with specimens in the Phillips collection (personal correspondence). These are the northernmost records for eastern Sonora. Marshall records the species as nesting at Rancho Pinos Altos in the Sierra Nacori, Sonora (Pac. Coast Avif., 32: 86, 1957).

Our specimen has been deposited in the Fish and Wildlife Service Collection at the U. S. National Museum. Dr. John W. Aldrich, following the nomenclature of Miller *et al.* (Pac. Coast Avif., 33: 73, 1957), has identified it as the subspecies *Tyrannus crassirostris pomalis* Bangs and Peters, of which *T. c. sequestratus* van Rossem (Condor, 43: 250, 1941) is generally considered a synonym.

Guadalupe Canyon is mostly in the Lower Sonoran Life Zone. Vegetation of the Upper Sonoran Zone gradually takes over towards the head of the canyon in New Mexico and on some of the higher hills in Arizona. The riparian canyon bottom is characterized by huge cottonwoods *(Populus fremontii)* and sycamores *(Platanus wrightii)*. Water is available at several stock tanks and ranch wells and reservoirs. Except for a few small springs and seeps, which run above ground for short distances during wet years, there is no permanent running water in the canyon.—Seymour H. Levy, *Route 9, Box 960, Tucson, Arizona.*

A Hybrid Between Barrow's and Common Goldeneyes.—On May 13, 1954, a drake goldeneye in full nuptial plumage was picked up in a moribund condition on Westwick Lake, 12 miles south of Williams Lake, British Columbia. The specimen is intermediate between *Bucephala islandica* and *B. clangula* and is probably a hybrid. It was prepared as a study skin and is now N. 4472 in the collection of the Museum of Zoology, University of British Columbia. The trachea was preserved with the specimen.

The facial spot of the hybrid is nearly round like that of adult male *B. clangula*, but with a dorsal extension of the white, similar to but not as extensive as that in

adult male *B. islandica*. The dimensions of the facial spot (in preserved specimens) are: *B. clangula*, length 24 mm., height 21 mm.; *B. islandica*, length 18 mm., height 38 mm.; hybrid, length 22 mm., height 30 mm. The principal iridescence on the head of the hybrid is reddish-purple, almost bronze, appearing greenish (*not* bluish-green) in certain lights. This differs from both the bluish-green gloss of *B. clangula* and the bluish-purple of *B. islandica*. The crown feathers of the hybrid are elongate, forming a dorsal crest similar to that of *B. clangula;* the feathers of the nape are also prolonged but not as much as in *B. islandica*.

Viewed from above, the bill of the hybrid tapers slightly from base to tip, not as much as in *B. islandica*, but more so than in *B. clangula*. The height of the bill at its base is greater than in *B. clangula*, but less than in *B. islandica*. The nail is large, as in *B. islandica*, but only moderately arched transversely and longitudinally; it is neither flat, as in *B. clangula*, nor conspicuously arched, as in *B. islandica*. A slight bony protuberance can be felt on the forehead of the hybrid; this is not as prominent as in *B. islandica*, nor is it as flat as in *B. clangula*.

The general appearance of the scapulars of the hybrid is closer to *B. islandica*, but the white spots are more elongate, tending toward the white stripes seen in *B. clangula*. The black margins of the feathers are wider than in *B. clangula*, narrower than in *B. islandica*, and elongated into pronounced lateral processes, as in *islandica*. The white area on the wing of the hybrid is considerably greater than in *B. islandica*, and somewhat less than in *B. clangula*. The white area involving the lesser wing coverts is intermediate between the two species. The bar formed by the black bases of the greater wing coverts is broken by the overlying white middle coverts. The flank feathers of the hybrid are intermediate, but closer to *B. islandica*. Anteriorly, the black lateral margins of the flank feathers are conspicuous but considerably narrower than in *B. islandica*. Posteriorly, the flank feathers are broadly margined with black both laterally and medially, much more so than in *B. clangula*, somewhat less so than in *B. islandica*. The feathers in front of the bend of the folded wing of the hybrid are nearly all pure white as in *B. clangula*, but a few of the more dorsal ones are tipped with black, giving a hint of the ventral extension of the black of the back typical of *B. islandica*.

In the hybrid the tracheal swelling anterior to the syrinx is intermediate in size and shape between *B. clangula* and *B. islandica*. The swollen region is shorter, and of greater diameter than is typically found in *B. islandica*. In addition, the dorsal portions of the tracheal rings are slightly displaced posteriorly, forming a small posterodorsal pouch, similar to, but not as pronounced as that found in *B. clangula*.

When found the hybrid was unable to fly, and swam and dove with difficulty. Its wing and leg muscles were partially paralyzed. The bird was moderately emaciated, without fat, and weighed only 813 grams. An adult male *B. islandica* shot on May 25, 1954, weighed 1066 grams and had considerable fat deposits. Autopsy of the hybrid disclosed nineteen lead shot in the gizzard, and the caecal contents were stained dark green. Death was ascribed to lead poisoning.

The bird was apparently unmated. It was seen in the same place for two days prior to capture and was at no time accompanied by a female. Combined testicular volume was only 1.0 cc., compared with 2.7 cc. for the adult male *B. islandica* mentioned above. The small testis size may be attributable to the lead poisoning, and is not necessarily correlated with the hybrid parentage. Westwick Lake is a

favored breeding lake for *B. islandica*, but is visited by *B. clangula* only on migration. In 1954, the last Common Goldeneye migrants were seen on May 9, an unusually late date ascribed to the much delayed spring.

I know of only one other specimen of a hybrid between *B. clangula* and *B. islandica*, an adult drake in full nuptial plumage taken in April, 1951, at Petitcodiac, New Brunswick, described by L. L. Snyder (Wilson Bull., 65 (3): 199, 1953). Zella M. Schultz (Murrelet, 39 (1): 11, 1958) notes a sight record of a hybrid male *B. clangula* × *B. islandica* at Seattle, Washington, in March, 1958. Annie P. Gray (Bird Hybrids, p. 63, 1958, Commonwealth Agricultural Bureaux, Farnham Royal, Bucks, England) lists only Snyder's record of this hybrid, but mentions reported hybrids between *B. clangula* and many other species of ducks. Hybrids between the two goldeneyes are probably more common than known specimens indicate. Hybrid females would be virtually indistinguishable, even in the hand, and males in full nuptial plumage would be difficult to distinguish in the field, except possibly for an observer thoroughly familiar with both species. It would be particularly interesting to study populations in regions where the breeding ranges of *B. clangula* and *B. islandica* overlap, in northern British Columbia, the Yukon, and Alaska.—MARY F. JACKSON, *Dept. of Zoology, University of British Columbia, Vancouver, B. C.*

First Common Scoter Collected in Texas.—Although several sight records are on file for the Common (Black) Scoter *(Oidemia nigra americana)* in Texas, the species apparently had not been collected, and therefore is included only in the state hypothetical list (Wolfe, Check-List of the Birds of Texas, 1956: 83–84). Texas is not mentioned in the range given by the A.O.U. Check-list (5th ed. 1957): 94, which states that in winter it occurs irregularly to Louisiana.

I observed a lone, immature Common Scoter for several minutes on November 4, 1956, through 7 × 35 binoculars at a distance of about 50 yards. The bird was swimming on the Laguna Madre about one mile south of the junction of the main Intracoastal Canal and the Harlingen Spur, Cameron County, Texas. I was unable at the time to collect it.

On November 11, I again saw a lone Common Scoter near the same location and succeeded in collecting it. Later the same day I saw, at close range, another Common Scoter, either a female or immature bird, flying with six Redheads *(Aythya americana)*. Identification of the collected bird, an immature female, was verified by Refuge Manager Luther Goldman, U. S. Fish and Wildlife Service, who prepared a study skin which is now on display at the headquarters of the Laguna Atascosa and Santa Ana National Wildlife Refuges, San Benito, Texas.

I spent considerable time on the Laguna Madre during the remainder of this and the following winter but saw no additional Common Scoters.—HENRY M. REEVES, *U. S. Fish and Wildlife Service, P. O. Box 407, Aberdeen, S. D.*

An Oklahoma Record of the Yellow Rail.—The A.O.U. Check-list 5th ed.: 158, 1957 mentions no record of the Yellow Rail *(Coturnicops noveboracensis)* from either Arkansas or Oklahoma. A supposed old Arkansas record is given by A. H. Howell (1911. Birds of Arkansas. 28), which was overlooked and which I quote:

> "The only record for the state is furnished by a specimen in the United States National Museum (No. 12641) labeled 'Fort Wayne, Ark., Lieut. Eustis.' This fort was located on the Arkansas-Oklahoma

boundary about 10 miles south of the Missouri line, on one of the branches of Spavina Creek."

M. M. Nice and L. B. Nice (1924. Univ. Okla. Stud. No. 286: 112), in summarizing birds which should be, but have not been, found in Oklahoma, note this as an Arkansas record.

Investigations reveal that this early fort was actually in the Cherokee Nation, Indian Territory, now Delaware County, Oklahoma. A most complete description of the location was found in "A Traveler in Indian Territory. The Journal of Ethan Allen Hitchcock," edited by Grant Forman (1930). On pages 73–75 Hitchcock describes his visit to the fort in February, 1842. He mentions his association with Lieutenant Eustis, who was stationed there. The fort was placed, he says, on the southwest edge of Beatie's Prairie, on a small tributary of Spavinaw Creek. Traced on a detailed map of this area we find that this site is 2 miles into Oklahoma from the Arkansas border. This location is recognized by the Oklahoma Historical Society. They have erected a marker relating the history of Fort Wayne, on Oklahoma State Highway 20, 5 miles to the north.

I inquired of the United States National Museum for any further information available on this specimen. In answer Dr. Herbert Friedmann writes:

> "There is no original field collector's label on the specimen, only the National Museum label. On it is merely stated that the specimen is a male and was taken at Fort Wayne, Arkansas, by Lt. Eustis. On the back is a No. 84. In our catalog entry, however, the date is given for the specimen, March 7, 1842, collected by Lt. Henry L. Eustis of the First Dragoons. The specimen was catalogued by the National Institute in July 1842 and entered in the National Museum Catalog on July 20, 1859. It had apparently originally been mounted and has since been dismounted."

Since Fort Wayne, Arkansas is in fact Fort Wayne, Oklahoma, I believe it is more logical to assume that this bird is an Oklahoma specimen instead of an Arkansas specimen. This is of particular interest because the Yellow Rail has not since been seen nor taken within Oklahoma.—JOHN S. TOMER, *4045 East 27th Street, Tulsa, Oklahoma, March 9, 1958.*

First Carolina Wren Taken in Colorado.—During routine banding activities on November 18, 1956, Mrs. Eleanor Hough of Boulder trapped a bird which she identified as a Carolina Wren *(Thryothorus ludovicianus).* It had been seen nearby on several occasions on preceding days at the feeding station of Mrs. J. B. Wheat. The bird was brought to me for additional verification. It was a male in good condition and it is now in the University of Colorado Museum (#6203). This is the first specimen of the Carolina Wren from Colorado. The nearest range reference given in the A. O. U. Check-list (1957) is Stapleton, Nebraska, over 250 miles to the northeast. However, there have been five sight observations reported from Colorado within the last four years, three at Colorado Springs, one at Palmer Lake, and one at Weldona (Aud. Field Notes, 9: 38, 387, 1955; 10: 393, 1956).—OWEN A. KNORR, *Department of Biology, University of Colorado, Boulder, Colorado.*

Occurrence of the Yellow-green Vireo in Florida.—Undoubtedly the highlight of the spring migration of 1958 along the Gulf coast was the occurrence of the Yellow-green Vireo *(Vireo flavoviridis),* tropical counterpart of the Red-eyed Vireo *(Vireo olivaceus),* in western Florida. A singing individual of this species appeared on the morning of May 4, 1958, on Fair Point, three miles south of

Pensacola, across Pensacola Bay, in Santa Rosa County. The writer, in company with Francis M. Weston and Lyman Goodknight, discovered the bird in a live oak *(Quercus virginiana)*, alternately singing and feeding on small green caterpillars. Although shooting was not permitted in the area, permission was finally secured in the late afternoon to collect the specimen. It proved to be, as expected, an adult male with moderately enlarged testes (4 mm.), and has been referred to the nominate race *(V. f. flavoviridis)* by George H. Lowery, Jr. The specimen has been deposited in the Louisiana State University Museum of Zoology collection.

In addition to the above specimen, a second individual was observed by the same party less than one mile east of the original locality on May 11, among a fine selection of incoming trans-Gulf migrants. This latter bird was not in song. Collecting was not possible.

These birds are presumably trans-Gulf migrants, probably from Yucatan. All incoming migrations in the Pensacola area in early May exhibited a definite Central American flavor, rather than West Indian. Further, these records may shed a little light on the seemingly amazing record from Godbout, Quebec, on May 13, 1883. Apparently this 1883 specimen and the two new records above were birds carried along in the wave of migrating Red-eyed Vireos. The bird of May 11 probably continued north, since it disappeared shortly thereafter with the other migrants.

North American records up to the last decade are summarized in Bent (U. S. National Museum Bulletin 197, *Life Histories of North American Wagtails, Shrikes, Vireos, and their Allies*, 334, 1950) and include: two specimens, the Godbout, Quebec, bird of May 13, 1883, and one taken at Riverside, California, on September 29, 1887 (these two records are the only ones accepted by the *A.O.U. Check-List*, 5th ed., 1957); one nesting sight record at Harlingen, Texas, in June, 1943; and three other sight records in southern Texas. Records since this time, as far as the writer can determine, consist only of additional sight records from southern Texas. The specimen of May 4, 1958, is apparently the third for North America, the first since 1887.

In regard to voice, the singing male was noted to have two very different phrasings. The most frequently employed was the typical double-noted vireo song, very similar in quality to the Red-eyed, but with longer pauses between notes, much as in the timing of the Yellow-throated Vireo *(Vireo flavifrons)*. The second song, heard only once, was a whisper song, audible only a few feet away, and consisting of a continuous warble of about fifteen seconds duration.

Examination of stomach contents showed only the remains of several caterpillars of the type noted in the field, not identified.

Further careful examination of migrating vireos along the Gulf coast in spring will probably turn up more of these birds in the future.—Burt L. Monroe, Jr., *Ridge Road, Anchorage, Kentucky.*

Weights of Sandhill Cranes.—On January 16, 1958 at the Bosque del Apache National Wildlife Refuge in Socorro County, New Mexico, a banding crew made up of members of the New Mexico Department of Game and Fish and the U. S. Fish and Wildlife Service, captured eight Sandhill Cranes *(Grus canadensis)*, with a group of Canada Geese *(Branta canadensis)*. The largest of these cranes weighed 14 lbs. 4 oz. and the smallest weighed 9 lbs. 12 oz. Other weights were: 12 lbs. 12 oz., 12 lbs. 8 oz,, 12 lbs. 8 oz., 11 lbs. 4 oz., 10 lbs. 12 oz., and 10 lbs. 12 oz.

These birds were captured with a cannon protected 3" mesh net 75' × 40' (see Dill and Thornesberry, 1950, Journ. Wildl. Mgh., **14** (2): 132–137), baited with shelled corn in an alfalfa field, at approximately 9 A.M. The cannons used were designed by Mr. Harvey W. Miller, Waterfowl Investigator for the Nebraska Game, Forestation and Parks Commission. The cannons were fired remotely with radio transmitter and receiver (Griebe and Sheldon, 1956, Journ. Wildl. Mgt., **20** (2): 203–205). Leg bands were applied and the birds were released at the trap site.

The extreme weight of 14 lbs. 4 oz. is greater than the maximum (13 lbs.) mentioned by Walkinshaw ("The Sandhill Cranes," Cranbrook Inst. Bull. No. 9: 9, 1949), and the smallest of the eight was heavier than the average weight given for females (9 lbs. 8 oz.) of the largest subspecies, *G. c. tabida*. The five specimens of *Grus canadensis* in the U. S. National Museum collection from the Bosque del Apache Refuge belong to the subspecies *tabida*, according to Dr. John W. Aldrich. None of the eight birds was sexed in the field and no other taxonomic characteristics were recorded. It seems probable, however, in view of the above information, that all eight of these individuals were of the subspecies *tabida*.—WILLIAM S. HUEY, *P. O. Box 4201, Santa Fe, New Mexico.*

Cattle Egrets Provoke Cattle to Move and Pick Flies off Bulls.—Between July 5 and August 5, 1958, my wife and I photographed the Cattle Egret *(Bubulcus ibis)* at Annandale Plantation in Georgetown County, South Carolina. We encountered numbers of these birds on repeated visits. On August 2, we counted as many as 125 Cattle Egrets associating with the cattle. Together with them, feeding in the grassy fields, were Snowy Egrets *(Leucophoyx thula)*, Little Blue Herons *(Florida caerulea)*, Glossy Ibis *(Plegadis falcinellus)* and White Ibis *(Eudocimus albus)*. The cattle on the plantation were fenced in groups and we concentrated on a group of about fifty with which some forty-odd Cattle Egrets were associated. The browsing animals followed a definite daily schedule with alternating periods of feeding and resting. While the animals fed, the egrets fed along with them. With straight short flights and running, the birds managed to keep at the head of the herd most of the time, picking up the insects stirred by the moving cattle. Only once was a Cattle Egret seen on the back of an animal of this herd. As the grass was particularly high, the bird presumably used the cow merely as a perch.

When the cattle rested on the ground, a different technique was at times employed by some of the egrets. Involved were ten to twenty birds. These birds exhibited a kind of restlessness not observed before. Short, circular flights were taken repeatedly over the herd and a definite animation of wings was manifest as the egrets literally bounced on and off the ground among the resting cattle. Seemingly, the birds were trying to stir up the cattle through wing movement. The increased movement on the part of the birds was striking. In the bright sunlight, the brilliant white of the flashing wings apparently stimulated a response in the cattle, for in a relatively short time they were on their feet and moving about again, stirring the insects for the now calmer birds.

This motion by the egrets, triggering an impulse in the cattle to move, was of irregular occurrence, for normally, when the animals rested, the egrets soon lost interest and flew away. In fourteen visits, on as many days spent with the herd, lasting from a few hours to the entire day, we saw this specific behavior four times. It occurred twice in mid-morning and twice in the late afternoon. Each time before its commencement, an increased activity was shown by the birds while

feeding, suggesting hunger. Perhaps, the inactivity of the cattle at this critical point set in motion the behavior of the egrets.

Enclosed in a field near the maintenance buildings of the plantation was a group of bulls accompanied by about six Cattle Egrets which fed along with them. When, in the late afternoon, the bulls sought a shady area to rest in some thirty feet from a house, the Cattle Egrets joined the bulls and walked all over the supine animals, picking flies off their bodies, the bulls appearing contented with the egrets' ministrations.—WALTER DAWN, *176 Wentworth St., Charleston, S. C.*

The Status of the Semipalmated Plover.—The relationship between the small ringed plovers—*Charadrius hiaticula* and *semipalmatus*—has long been in dispute. These forms were described as full species under the old nondimensional species concept and so maintained until 1930. At this time Salomonsen (1930, Journ. f. Orn., 78: 65–72) pointed out the great similarity between these forms, that their ranges are allopatric and the lack of evidence of reproductive isolation between them, and therefore concluded that they were conspecific. Salomonsen's conclusion was accepted until Wynne-Edwards (1952, Auk, 69: 367–369) reported both *hiaticula* and *semipalmatus* from one locality in Baffin Island during the breeding season without showing any signs of interbreeding. Because of Wynne-Edwards'

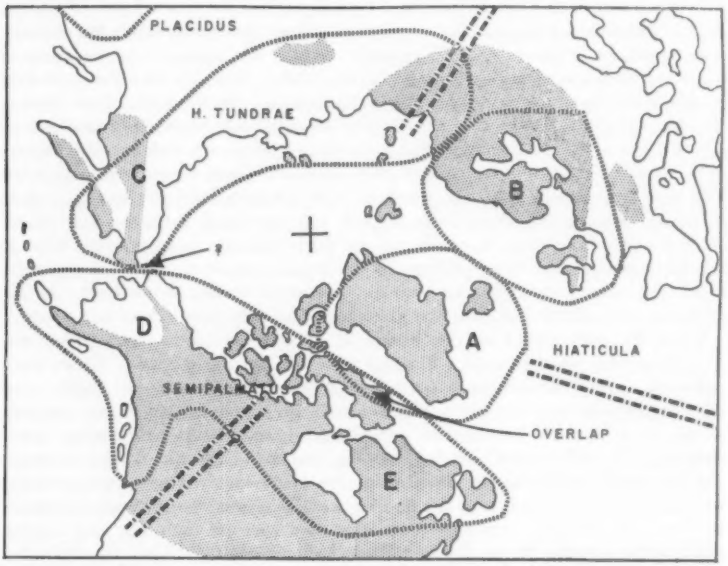

FIGURE 1. Distribution of the *Charadrius hiaticula-semipalmatus* complex during the breeding season. The letters A to E represent the five populations compared in this study; their limits coincide with the dotted lines except for the separation of the western and eastern *semipalmatus* populations which is not shown and which is approximately at Northwest Territories, Canada. The glaciated areas during the last ice advance are stippled. The heavy double lines separate the three major refuges for shorebirds during the last glacial advance.

findings, most ornithologists (e.g., the Committee on Nomenclature of the American Ornithologists Union, 1956, Auk, 73: 448) now regard the two forms as good species. In my review of the plovers (1958, Bull. Mus. Comp. Zool., 118: 72), I maintained *hiaticula* and *semipalmatus* as conspecific, but did not give my reasons for this action. I wish to present these reasons here to bring the attention of more workers to this problem.

The accompanying map clearly illustrates the problem. *Charadrius hiaticula* and *semipalmatus* have a circumpolar distribution during the breeding season. (A related form, *placidus*, usually considered to be a separate species, is found in eastern China.) We know that *hiaticula* and *semipalmatus* coexist in a very small region in eastern Baffin Island during the nesting season without interbreeding. East and west of this point are connected, interbreeding populations of *hiaticula* and *semipalmatus* respectively until the Bering Straits are reached. Here is the problem: Does *semipalmatus* interbreed with *hiaticula tundrae* in this region or is there a reproductive gap between the two forms? There are two possibilities:

(a) If the two forms interbreed, then *hiaticula* and *semipalmatus* are conspecific—a series of intergrading populations with terminal overlap in Baffin Island.

(b) If there is a reproductive gap, then *hiaticula* and *semipalmatus* are good species.

What are the facts and which alternative do they support?

There is no direct proof that the two forms coexist during the breeding season in the Bering Straits' region. *Charadrius hiaticula tundrae* has never been recorded from North America, and while *semipalmatus* has been reported from Siberia (see "Catalogue of the Birds in the British Museum," vol. 24 and Hartert, "Die Vögel der paläarktischen Fauna," vol. 2), little is known of the exact distribution of these forms in the Chukotski Peninsula. Johansen (1958, Acta Arctica, Fasc. 9, pp. 10–12) states that no specimen of *semipalmatus* has been reported from the Chukotski Peninsula in recent years and indicates that the nature of the contact between *semipalmatus* and *tundrae* in the Chukotski Peninsula is still unknown. In fact, I would even question the identification of the *semipalmatus* specimens from Siberia, for these specimens were collected and identified before ornithologists realized that *C. hiaticula tundrae* bred in eastern Siberia. However, I have not seen the specimens and cannot be definite on this point.

I measured and compared the following characters—wing length, tail length, bill length and tarsus length—from the five populations shown on the map (table 1). When plotted on graphs, these structures all show the same pattern of geographic variation. There is a general cline from the large *hiaticula* in Europe to the small *semipalmatus* in eastern North America; however, the *hiaticula* populations form one cluster and the *semipalmatus* populations form a second cluster. The greatest difference is between the eastern *semipalmatus* and the Greenland *hiaticula* populations, but this is of scarcely more than "subspecific" value. The gap between the two Bering Straits populations is somewhat larger than the gaps within the clusters but still not even of "subspecific" value. The same conclusion is reached for color differences. In most features of plumage, *tundrae* is more or less intermediate between the European *hiaticula* and the eastern *semipalmatus*, which can be distinguished by these features. The Bering Straits populations could be separated only on the basis of the white superciliary stripe, and even this was not a very satisfactory means of separation. I was unable to examine the degree of webbing of the toes in the dried study skins.

TABLE 1

Population	Wing length			Tail length			Bill length			Tarsus length		
	R.	M.	S.D.	R.	M.	S.D.	R.	M.	S.D.	R.	M.	S.D.
"A" (7)	126–135	130	—	57–64	61.4	—	17–21	19.2	—	26–30	27.6	—
"B" (18)	120–134	129	4.66	57–66	61.4	3.49	18–23	20.3	1.33	23–28	25.8	1.35
"C" (26)	121–132	126.9	2.89	56–64	59.1	2.11	18–21	19.6	.75	24–29	26.2	1.45
"D" (33)	116–125	119.8	2.91	53–61	55.7	2.27	16–20	17.8	.94	22–27	24.3	.95
"E" (32)	114–129	122.5	3.22	53–60	56.5	2.02	15–19	17.2	1.00	22–26	24.3	1.13

TABLE 1. Mensural data for the five populations of the *Charadrius hiaticula-semipalmatus* complex. The symbols used are: R = range of the measurements, M = the mean, and S.D. = the standard deviation. All measurements are in millimeters. The sample size is given in parentheses after the letter designating the population.

The Pleistocene history of the shorebirds has been recently reviewed by Larson (1957, Acta Vertebratica, 1: 1–84). Following his data, I have indicated the glaciated areas on the map and shown the divisions between the three main refuges for shorebirds—Europe, Siberia-Alaska, and eastern North America—by the heavy double lines. Larson postulates, and quite correctly I believe, that *hiaticula* was present in Europe during the last advance of the ice sheets and *semipalmatus* was present in eastern North America and possibly Alaska at this time. Whether any member of this complex was present in most of Siberia at this time is still a matter of question. The important fact is that the ice sheets formed first and melted last in western Europe and eastern North America, thereby separating *hiaticula* and *semipalmatus* longer in this region than in the Bering Straits. Thus it is possible that the two forms met and interbred at the Bering Straits long before their ranges overlapped on Baffin Island.

These are the facts of the past and present distribution and of the geographic variation of external features. No definite conclusion can be deduced from them; more field work and collecting must be done in the Bering Straits before we can reach a final answer. However, the available evidence argues more for interbreeding of *hiaticula* and *semipalmatus* in the Bering Straits than for a reproductive gap between the two forms. Thus, I would recommend that *hiaticula* and *semipalmatus* be considered members of a single species which exhibits circular overlap. I must emphasize that this is only a suggestion, not a final decision; we must maintain an open mind until conclusive evidence has been gathered.—WALTER J. BOCK, *Biological Laboratories, Harvard University, Cambridge 38, Mass.*

Estimating a Hummingbird Population.—Having had a hummingbird feeding station for a number of years in my own garden in Denver, Colorado, and another on the Cherokee Ranch, 25 miles south of Denver in rough pine and scrub-oak country, I have found it of interest to work out a method for estimating the number of birds coming to the feeders. The basic requirement is for a type of feeder which does not leak or drip and which excludes other birds, bees, wasps, and in fact all customers except hummingbirds. The feeder I now use meets these specifications. An accurate record can be kept of the output from such a

feeder and, if we have some idea of the consumption of syrup per bird per day, we can estimate the total number of customers.

Based on a number of experiments and observations over the years, I now use a syrup made of equal parts, by volume, of granulated sugar and tap water, and I figure the consumption per bird per day at one-eighth of an ounce of syrup. This figure is based on a single female Broad-tailed Hummingbird *(Selasphorus platycercus)* in my garden a few years back, plus a thirteen-day record for two young Broad-tails confined in the Bird House at the Denver Zoo. The average for the single female was 0.128 ounces of syrup per day and that for the two in the Bird House, 0.115 ounces per bird per day. Both figures are close to one-eighth ounce. This figure, I think, errs somewhat on the conservative side, that is, it gives a population figure under, rather than over, the actual. Using it I have had interesting results in the past three years.

In 1956 at the Cherokee Ranch station on July 24 a peak estimate of 166 birds was made. At this time the resident Broad-tails had young fully grown, or nearly so, and many migrating Rufous Hummingbirds *(Selasphorus rufus)* were present. At the peak in 1957 on August 10 no Rufous Hummingbirds were in the area and the total population was estimated at 37. What caused the great drop from the previous year was not apparent, but it was evidently not a strictly local matter as I had a number of reports from other places in Colorado where the experience was the same. In 1958 it was necessary to move the station about half a mile and in mid-June, before hatching time, the population using the feeders was figured at 25. The peak count, on August 9, was 33. Again no Rufous Hummingbirds appeared, though they were seen at various other places in this area.—WALKER VAN RIPER, *Denver Museum of Natural History, Denver, Colorado.*

A Chipping Sparrow nest in which eight eggs were laid and seven young reared.—On May 29, 1958, at 8:30 P.M. I found the nest of an Eastern Chipping Sparrow *(Spizella passerina passerina)* four feet, one inch from the ground in a small Norway spruce in the yard of our cottage one-half mile from the shores of Lake Michigan, in Section 7, Laketon Township, Muskegon County, Michigan. An incubating female flushed from the nest which contained seven eggs. I was very much surprised at the large set of eggs. The next morning, May 30, the nest contained, at 6:00 A.M., eight eggs. The eggs were of two different sizes in groups of four. Four measured 17.4 x 12.8, 17.4 x 12.6, 17.4 x 12.5 and 17.1 x 12.6 millimeters; the other four, 16.0 x 12.6, 16.5 x 13.4, 15.8 x 12.8 and 16.6 x 13.0 millimeters. The last set weighed 6.7 grams; the first set, 6.2 grams. The egg shapes of the two groups also differed some and the spots at the larger ends were blacker in the first set, dark gray in the second set with a few blackish spots. Four other Chipping Sparrow nests were found the same week-end, within 200 feet from the above nest. All of these were located in coniferous trees and in three the females were laying. The other had a full complement of four eggs. The final complements in all were four, as is usual for first sets here in Michigan. Second sets are sometimes four, sometimes three eggs.

On June 9, a female was incubating the eight eggs but on June 13, the nest contained seven young about two days old and one unhatched egg. The seven young were banded on June 15 and as I watched the nest, three adults fed the young. All three birds were in the tree above the nest with food at once and all fed the young in this nest. Two of the adults were banded. On June 21 all seven young left the nest.

On July 13, 1958, within 115 feet of this nest I found another Chipping Sparrow nest with six eggs. These eggs were spotted with blackish spots in wreaths at the larger ends. They measured, 18.5 x 13.5, 18.0 x 13.6, 18.5 x 13.6, 18.9 x 14.0, 18.9 x 13.8 and 19.5 x 13.5 mm. This nest met with failure.

The only other time that I have found a Chipping Sparrow nest with more than the one complement of eggs was June 2, 1956, when a nest was found three feet six inches up in a small juniper in Section 27, Convis Township, Calhoun County, Michigan. This nest contained seven eggs and one Cowbird egg. On June 7 this nest contained three young and four eggs. On June 12 it had been destroyed.

Apparently in all of these cases two females laid eggs in one nest. Apparently in the May-June, 1958 nest, two females were mated to the same male. This was probably a case of polygamy.—LAWRENCE H. WALKINSHAW, *1703 Wolverine-Federal Tower, Battle Creek, Michigan, October 20, 1958.*

Notes on Some Philippine Bulbuls.—We accept four species of the genus *Hypsipetes* Vigors, 1831 (which name is not preoccupied by *Ypsipetes* Stevens, 1829, in Lepidoptera, and must replace *Microscelis* Gray, 1840) for the Philippines proper; but the species limits we draw are somewhat different from those of the latest survey in Delacour and Mayr (1946, Bds. Philip., pp, 175–177); certain names need consideration; a new subspecies is described; and habitat differences and overlap in range are reviewed.

The species are:

1. *H. amaurotis* of Japan, etc., has three well-marked races, as usually accepted, in the islands just north of Luzon, where it is the only *Hypsipetes* occurring.
2. *H. siquijorensis,* with three well marked races, *siquijorensis* on Siquijor, *monticola* on Cebu (now extinct?), and *cinereiceps* on Romblon and Tablas, presents no problem though the peculiar range on several scattered central islands is noteworthy.
3. *H. everetti* has two lightly differentiated races in the Samar to eastern and central Mindanao area, and one very well marked race *haynaldi* in the Sulu Islands. Delacour and Mayr *(loc. cit.)* included *rufigularis* with these in one species, but we include *rufigularis* in the species *H. philippinus* (see below). Apparently the species *H. everetti* is absent from Zamboanga Peninsula of western Mindanao and from Basilan, which gives the species an interrupted range.

The Samar-Mindanao birds are separable into two subspecies. As the type locality of *everetti* is Surigao, northern Mindanao, we name the Samar birds:

Hypsipetes everetti samarensis new subspecies

Type.—Chicago Natural History Museum No. 247,736, from San Isidro, Samar, Philippine Islands. Adult male collected April 27, 1957, by D. S. Rabor.

Diagnosis.—Like *H. e. everetti* from Mindanao but differs in upper parts being more golden or olive green (less bright, clear green); in throat and upper breast being darker and duller ochraceous; in lower breast and abdomen being duller, more golden yellow, and in flanks being more heavily washed with olive.

The race *haynaldi* of Sulu Archipelago is much more different in being much more olive above; throat with a duller ochraceous wash; abdomen much duller yellow and flanks nearly clear olive.

Wing ♂ (10) 114–121 (av. 117.0); ♀ (10) 105–115 (av. 110.8)
Tail ♂ (10) 93–101 (av. 96.9); ♀ (10) 88–95 (av. 91.6)

Culmen ♂, 28–29.5; ♀ 27–28 mm.

Range.—Samar. Probably Leyte birds also belong here, as well as those of Panaon.

Remarks.—It is interesting that the brightest populations of *H. everetti* are those from the central part of the range of the species. The Samar birds are only moderately duller; the Sulu Islands birds are much duller.

4. *H. philippinus*. This species has appeared in recent years as *philippensis* Gmelin, 1789 (preoccupied), *philippensis* Strickland, 1844 (an available name), and *gularis* Pucheran, 1855 (also an available name) (see Hartert, 1916, Bull. Brit. Orn. Cl., 36, p. 59), but *Turdus philippinus* Forster, 1795 (Faunula Indica, ed. 2, p. 8, type locality Philippines) is the earliest available name, as Mr. H. Deignan pointed out to us. It is not a *nomen nudum* as Sherborn indicates in his "Index Animalium," for it appears with a reference to a description.

This species has five subspecies: (1) *philippinus*, (2) *guimarasensis* (not *guimarensis* as sometimes written), (3) *saturator*, (all lightly marked races), (4) *mindorensis* (a very distinct race), (5) *rufigularis* (a very distinct race). This is the most widespread species, from Luzon and Mindoro to Mindanao and Basilan, but missing on Siquijor, Tablas, and Romblon.

H. p. rufigularis was at one time considered conspecific with *everetti* and *haynaldi* (Delacour and Mayr, 1946, Bds. Philipp., p. 176), but Rabor (1955, Silliman Jour., 2, p. 103) showed this cannot be, and kept *everetti* a species with *rufigularis* and *haynaldi* forming another species. However, we now agree that *haynaldi* be kept with *everetti* as an olive green and yellow species and that the olive brown *rufigularis* be separated from them.

The main objection to uniting *rufigularis* and *philippinus* in one species, despite their similarity, has been that *H. p. saturatior* and *rufigularis* both occurred on Mindanao. However, *saturatior* is known only from eastern Mindanao, while *rufigularis* is known only from western Mindanao and Basilan. They are geographical representatives and *rufigularis* differs chiefly in being larger and lacking the streaking on the rufous throat. It seems advisable to consider them conspecific.

All these Philippine members of this genus are very closely related, judging by their general similarity. Even the striking color differences between the olive green-yellow *everetti* and the olive brown and greyish-white of the other forms is partly bridged by the race *H. e. haynaldi*.

Their close relationships are further indicated by their ranges being largely allopatric. *H. amaurotis* overlaps with no other form; *H. siquijorensis* occurs with *philippinus* only on Cebu; *H. everetti* occurs with *philippinus* only in the Samar—east and central Mindanao area. Otherwise there is only one species to a genus in any one area.

It would seem that the ranges of the various species are mutually exclusive for the most part, barriers to the distribution of each other, though the overlap that does occur indicates specific status.

The fragmented range of *siquijorensis* from scattered central islands and of *everetti* (absent from Zamboanga-Basilan) suggests that they are older, relict species ousted by an expanding *philippinus*.

Where two species overlap, a difference in habitat preference has been noted. Thus *H. everetti* on Samar is more of a hill forest bird, less a second growth lowland species like *H. philippinus*. Even on Sulu Island where *H. everetti* alone

occurs, it is still a forest bird. *H. siquijorensis monticola* on Cebu is a hill forest bird compared with *philippinus* that also lives in second growth lowlands. However, habitat can change from island to island, for on Siquijor Island *H. s. siquijorensis* is the ecological as well as geographical representative of *H. philippinus.*

Rabor found that *H. p. rufigularis* on northern Zamboanga was a hill forest bird (i.e. apparently occupying the ecological niche that *H. everetti* occupies elsewhere), and that the lowland second growth, a normal habitat of *H. philippinus,* was untenanted by any *Hypsipetes;* while earlier, Bourns and Worcester found *H. p. rufigularis* common along forest edges, in second growth, and in guava bushes, i.e. in a typical *H. philippinus* habitat (McGregor, 1909, Manual Philip. Bds., p. 507). In islands where *H. philippinus* alone occurs it may range into mountain forests, and on Luzon even into upland pine forests.

Evidently habitat data must be used with as much caution as any other type of taxonomic data, with the drawback that the original cannot be checked.—A. L. Rand, *Chicago Natural History Museum, Chicago, Illinois; and* D. S. Rabor, *Silliman University, Dumaguete, Negros, P. I.*

Observations of Whimbrel, *Numenius phaeopus,* and Chilean Flamingo, *Phoenicopterus chilensis,* in June near the Straits of Magellan.—On the morning of June 29, 1958, Mr. and Mrs. Arthur Huntley and I found two Whimbrels (Hudsonian Curlews) feeding in a flooded field about 200 yards from the Straits of Magellan at a point along the road approximately 20 kms. north of Punta Arenas, Chile. The A.O.U. Check-list of North American Birds (1957: 183) gives as the southernmost record, Chiloé Island, Chile, which is at least 600 miles north of Punta Arenas. Johnson, Goodall and Philippi (1957, Suplemento de las Aves de Chile: 419) report seeing four in November, 1952, on the south shore of the Straits; so the species may prove more than casual in this area.

On June 28, 1958, Mr. and Mrs. Robert Williams and I found a flock of about 80 Chilean Flamingos feeding along the shores of the Fitzroy Canal between Seno Otway and Seno Skyring near Punta Arenas. This flamingo has been noted before in the Magellanic area. It is of interest that approximately 25 per cent were in gray immature plumage, most of them in a separate group which flew away separately from the larger group composed almost entirely of adults.—William Belton, *National War College, Washington, D. C.*

Competition for Food Between Five Species of East African Vultures.—In the *Themeda-Acacia* savannahs of Queen Elizabeth National Park, astride the equator at 3000′ altitude in western Uganda, five species of vultures occur. While working on other biological problems in that area, it was interesting to speculate how completely these related scavengers competed with one another for food. Frequently all five species could be seen feeding on the same carcass.

In big game studies in that area, it was necessary to obtain a few specimens each of most of the large mammal species. The killing and processing of these animals in the field sometimes failed to attract vultures. Presumably, on such occasions, the local vultures were busy elsewhere, or if early in the day, had not yet left their roosts. Most frequently, however, mammal collections were made between 8 and 11 a.m. and there were prompt gatherings of vultures at the sites.

At kills, it was usually the small Hooded Vultures *(Necrosyrtes monachus)* which were first seen in the tops of nearby euphorbia or acacia trees or on the ground nearby. The larger White-backed Vultures *(Pseudogyps africanus)* soon joined

them in force. Ruppell's Griffons *(Gyps ruppellii)* were much fewer but were also usually prompt in arriving. It was usually a half-hour or so before Lappet-faced *(Torgos tracheliotus)* and White-headed *(Trigonoceps occipitalis)* Vultures were seen. The approximate percentages of abundance at most gatherings were Hooded Vultures 10, White-backed 85, Griffons 2, Lappet-faced 2, White-headed 1.

A similar precedence prevailed in the order of attack after the specimen remains were abandoned by us. The Hooded Vultures would hurriedly dash in for a few quickly bolted portions. Almost immediately, they would be shouldered aside by the larger and more numerous White-backed Vultures, which also fought greedily among themselves as they tore at the carcass. The Hooded Vultures would retire to the fringes of the heaving, scrambling group and dart in for occasional bits which became scattered. The infrequent Griffons would come in rather soon, forcing themselves individually among the pack of smaller birds and taking possession of whatever food supply they could dominate, with numerous sallies at the surrounding pack of pressing White-backed Vultures. The large Lappet-faced Vultures were even more fierce. They boldly seized whatever food they wished. Invariably, however, they did not come in to a carcass until large numbers of other vultures had already gathered there. The White-headed Vulture was the scarcest species. If it appeared at all, it was the last to arrive, but African assistants invariably remarked that this was indeed the "bwana kubwa," the big boss. The great eagle-like birds would stride haughtily among the lesser scavengers. Their huge beaks were thrust angrily at any bird not giving way before them. They then fed slowly, with apparent dignity, if there was any food remaining at the time of arrival.

Hooded Vultures usually remained longest nearby after a carcass was eaten clean. They picked about for some time among the scattered bones and pieces of heavy inedible skin (of hippopotami, elephants, and buffalo). This was especially true at carcasses left by lions and other predators, on which more meat remained than we left behind on our kills. Otherwise the identical sequence of events seemed to prevail on predator kills as on ours.

There is the possibility that the several vulture species hunt differently or at different altitudes. It seems quite likely, too, though direct evidence is lacking that one or more of the less numerous species (Lappet-faced, White-headed, and perhaps Griffon) do not hunt directly but are instead attracted by the descents of gathering vultures of other species. Of the several species on the area, only the Hooded Vulture was seen at times feeding on odd dead small animals along roads, early in the morning, in this case competing for these foods with the kite *(Milvus migrans)*. According to Macworth-Praed and Grant (Birds of Eastern and North-eastern Africa, Vol. 1, London, 1952), the White-headed Vulture may on occasion kill its own prey.

All in all, it appears that there is commonly direct competition for the same foods between the five vultures of the region. They do display differences in aggressiveness while feeding, however, and in general, their ability to seize food seems to be related to their body size. But it is interesting that the most numerous, and presumably the most successful in terms of population competition, is not the largest and fiercest species. It is, however, the larger of the two that have perfected the ability to arrive early at a carcass. It would be interesting to know whether White-backed Vultures find food quickly because they are abundant and guide each other to it, or whether they are abundant because they find food

quickly and thus enhance their survival rate. Since the Hooded Vulture usually is even quicker in finding food and yet is less common, it would seem that in the area studied at least, abundance alone, once achieved, is an influential factor in successfully competing for food.

Though wide-ranging in Africa, these species all show some differences in geographic distribution (see Mackworth-Praed and Grant, *op. cit.*) which must reflect differences in habitat tolerances and competitive relationships. From the standpoint of rates of possible population growth, Mackworth-Praed and Grant list all five species as usually laying one egg per clutch, but differences between species in length of breeding season and tendencies to renest are not available. Hence, average reproductive rates of the several species populations cannot be accurately compared. A more complete appraisal of interspecies competition within this group of vultures will require observations of feeding habits, habitat requirements, and reproductive rates in at least several parts of Africa.

This note is a portion of the ecological work carried out under a Fulbright Grant administered by the U. S. Educational Commission in the United Kingdom, the Uganda National Parks, Uganda Game Department, and their cooperators. My sincere appreciation is extended to the officials of these organizations and to Dr. Wendell Swank, my partner in study there.—GEORGE A. PETRIDES, *Departments of Fisheries and Wildlife and Zoology, Michigan State University, East Lansing, Michigan.*

A Previously Undescribed Recurvirostrid from the Eocene of Utah.—In 1953, Mr. Kurt E. Boker sent fossil fragments of the bones of the left wing of a bird to the Museum of Natural History of the University of Kansas for identification. The fossil is from Eocene deposits in Utah. Study of these fragments reveals that they represent the family Recurvirostridae, which has not previously been recorded from pre-Pleistocene deposits. The extinct bird was a giant in its family, having had a wing spread of more than three feet.

Elements present include the distal 39 millimeters of the humerus, the entire lengths of the radius and ulna, radiale, ulnare, and the proximal portion of the carpometacarpus including carpals II, III, and IV. With the exception of the carpometacarpus and the distal ends of the adjoining radius and ulna, the fragments are so poorly preserved as to be useless in any determinations.

The fragments now are embedded in three pieces of the matrix (see fig. 1). When the second piece was split away from pieces one and three, parts of the radius and ulna remained in the second piece; excepting the proximal part of the ulna and distal parts of radius and ulna, the bones split lengthwise. The distal part of the humerus probably is the outer surface. At least part of each element is compressed and in consequence somewhat distorted.

This Eocene bird differs so much from both of the living recurvirostrids in size and configuration as clearly to deserve designation as a new genus and species. It may be known as:

Coltonia recurvirostra new genus and new species

Type.—No. 10105 of the Museum of Natural History, University of Kansas; fragments of left humerus, radius, ulna, and carpometacarpus; from fine-grained limestone of the Colton Formation of the Eocene, mouth of Ephraim Canyon, Wasatch Plateau, Sanpete County, Utah; collected by Kurt E. Boker.

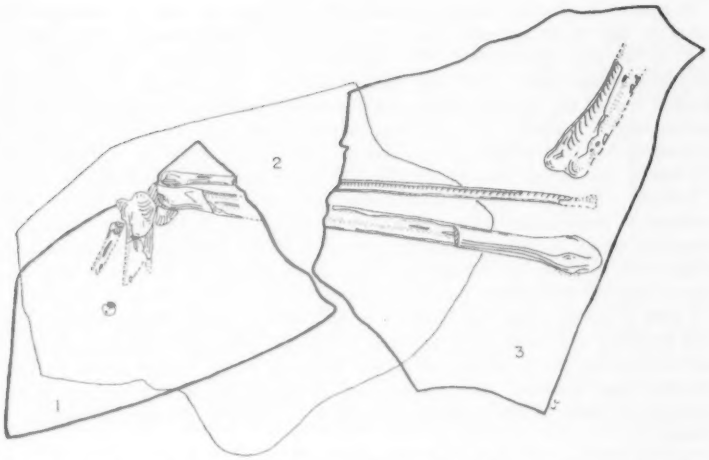

FIGURE 1. *Coltonia recurvirostra*. Drawing of type, K.U. 10105, × ½. Piece No. 1 of the matrix reveals the proximal parts of the left carpometacarpus, radiale, ulnare, and distal ends of radius and ulna. Piece No. 2 of the matrix reveals the proximal parts of the left radius and ulna and the distal end of the humerus. Piece No. 3 of the matrix, the edges of which are represented by the fine line, overlaid pieces 1 and 3 indicated by the heavy lines.

TABLE 1

MEASUREMENTS IN MILLIMETERS OF RECURVIROSTRIDS

Species	*Width of carpometacarpus**	*Length of Radius*	*Length of Ulna*	*Width of Radius***	*Width of Ulna***
Recurvirostra americana (KU 23135)	9.0	76.0	80.0	3.0	4.5
Himantopus himantopus (KU 23379)	8.5	71.0	75.0	3.0	4.5
Coltonia recurvirostra (KU 10105)	12.0	131.5	136.5	3.5	6.5

* Measured from posterior edge of anconal rim of trochlea to outermost point of process of metacarpal I.

** Measured at a point 3/8 of the length of the ulna from its distal end (more precisely, 30 mm. from distal end in *Recurvirostra;* 28 mm. in *Himantopus;* and 50 mm. in *Coltonia*).

Diagnosis.—All known bones approximately 1.7 times as long as corresponding bones in the Avocet *(Recurvirostra americana)* and approximately 1.8 times as long as in the Black-necked Stilt *(Himantopus himantopus)* (see Table 1). Carpometacarpus more nearly like that of the stilt than that of the avocet, the anconal rim of the trochlea being nearly rounded instead of possessing a bluntly pointed edge. Metacarpal I resembling that of extant forms of family, but process protruding less prominently; distal end of ulna curving much as in living kinds, but having less abrupt junction of outer condylar rim and posterior edge of shaft.

Remarks.—Although the elements of the fossil show some signs of having been flattened in preservation, as mentioned, measurements of width (taken where little distortion seems to have occurred) indicate that the bird was similar in body proportions to living recurvirostrids. The measurements of the radius and ulna suggest that the bones were slenderer than in the two living genera of the family.

I wish to acknowledge the kindness of Mr. Kurt E. Boker, Kellys Island, Ohio, who provided the fossil material upon which the preceding discussion is based, and the helpful advice of Dr. Alexander Wetmore of the United States National Museum, who examined the fossil critically, aiding greatly in its identification and description.—John William Hardy, *Museum of Natural History, University of Kansas.*

The correct specific name of the Quetzal, *Pharomachrus mocinno*.—The most beautiful and legendary bird of Middle America was named by Pablo de la Llave *"Pharomachrus Mocinno,"* in honor of José Mariano Mociño, an early Mexican naturalist and participant in a scientific expedition to Guatemala (Registro Trimestre, **1**, no. 1: 48, 1832). Until recently authors followed the original describer in spelling the specific name *mocinno*, with "nn" (see synonymy, Ridgway, Birds of North and Middle America, vol. 5: 738, 1911; Cory, Catalogue of Birds of the Americas, pt. 2, no. 2: 319, 1919; Dickey and van Rossem, Birds of El Salvador: 284, 1938). In 1945 Peters (Check-list of Birds of the World, vol. 5: 148) listed the specific name as *"mocino,"* with a single "n," and (erroneously) cited de la Llave as having named the bird *"Pharomachrus Mocino."* Zimmer (Amer. Mus. Novit., no. 1380: 50, 1948) thought Peters purposely emended de la Llave's name on the assumption that the Spanish letter "ñ" in Mociño's name was better transliterated into "n" than into "nn," and added, "I prefer to revert to De la Llave's original spelling." As Peters' spelling has been copied in influential recent works (Blake, Birds of Mexico, 1953; Miller *et al.*, Distributional Check-list of the Birds of Mexico, Pt. 2: 11, 1957), it seems advisable to call attention to the fact that no emendation was warranted. The International Rules provide: "The original orthography of a name is to be preserved unless an error of transcription, a *lapsus calami*, or a typographical error is evident." De la Llave's original spelling was both intended and correct. He used the same form in a later paper (La Naturaleza, 2: 17, 1874). Latin words with "nn" generally softened in Spanish into "ñ," and the "ñ" sound was formerly written "nn." The *tilde* represents the suppressed extra "n" of the older orthography. Transliteration into Latin of the Spanish "ñ" by "nn" was standard scientific usage—recommended by the A.O.U. Code of Nomenclature: 65, 1892. As de la Llave's spelling, *mocinno*, was in no sense an error, it should be retained.—E. Eisenmann, *American Museum of Natural History, New York, N. Y.*

REVIEWS

The Comparative Biology of the Meadowlarks *(Sturnella)* in Wisconsin.—Wesley E. Lanyon. Publ. Nuttall Ornith. Club No. 1, Cambridge, Mass., published by the Club. [iv] + 67 pp. 31 figs. 1957. (Procurable from Mass. Audubon Soc., 155 Newbury St., Boston, Mass.) Price, $2.00 (cloth), $1.50 (paper). There is a critical shortage of publications which will accept long papers. The Nuttall Ornithological Club is to be congratulated on initiating such a series, made possible through the generosity of the late James Lee Peters. They are also to be congratulated on selecting Lanyon's important study of the meadowlarks in Wisconsin for the first number of the series.

Since Audubon discovered the Western Meadowlark *(Sturnella neglecta)* in 1844, there has been a controversy over whether it and the Eastern Meadowlark *(S. magna)* should be treated as full species or as subspecies. In his studies in the field and on hand-raised birds, Lanyon has analyzed vocalizations of the adults and investigated the development of vocalizations in young birds. He has compared the ecological preferences of the two forms (more extensively reported in Ecology, 37: 98–108, 1956) and made detailed comparative studies of territory, pairing, courtship, and breeding biology. From these studies, Lanyon concludes that the Eastern Meadowlark prefers more moist situations than the Western Meadowlark; that the very different call notes of the two species are inherited (or, if learned, learned during the nestling period), whereas the primary songs are learned; that behavior associated with the establishment and maintenance of territory and with pair formation and courtship is essentially similar in the two species, as is their breeding biology. Differential habitat preferences reduce the number of interspecific contacts, but it is the role of the female in responding to males rendering the proper set of auditory stimuli (evidently in this case the species-specific call notes rather than the songs) which prevents the formation of mixed pairs and which thus maintains the two forms as good species in the north-central United States.

This study was well conceived and executed. It not only presents the solution to a century-old problem but also is an important contribution to the field of speciation. The only serious criticism, I think, should be addressed to the editors of the Nuttall Club who might well have planned more carefully the lay-out of their new series. The small pages will not prove economical in the long run, and the narrow margins not only are unattractive but also are insufficient for proper binding. Neither the preliminary pages nor the pages of plates (referred to as "figures") are numbered. The price has not been included nor has the name and address of the organization or person handling sales of the series.—Robert W. Storer.

A Coloured Key to the Wildfowl of the World.—Peter Scott. The Wildfowl Trust, Slimbridge, Gloucestershire. 96 pp., 23 plates. 1957. Price, 9 s. 6d. This hand-guide to all the species and subspecies of the Anatidae is an elaborated version of an earlier black and white guide, mainly for use in assisting in the identification of live birds in the incomparable waterfowl collection at the Wildfowl Trust, but also of great value as a guide in any zoo or even under field conditions. A total of 147 species, comprising 247 forms, are shown, including both sexes where they differ noticeably, as well as major color phases of the polymorphic forms such as *Anser c. caerulescens* and *Chloephaga p. picta*. Pages facing

the plates provide the Latin and common English names, and also give an abbreviated statement of range. Immature and "eclipse" plumages are not shown. The arrangement and systematic treatment is essentially that proposed by Jean Delacour and Ernst Mayr in 1945 (Wilson Bull., 57: 3–55), with a few recent modifications made by Delacour in his "Waterfowl of the World" monograph. Thus the torrent duck tribe "Merganettini" is merged with the Anatini, whereas the eiders are given a tribal status (Somateriini) and are placed between the Anatini and the Aythyini. Detailed head drawings of the white swans, snow geese, eiders and scoters greatly assist in recognizing their diagnostic criteria. Domestic varieties are also presented for comparison. Although the quality of the color reproduction cannot, of course, compare with Scott's plates in Delacour's monograph they are nevertheless a great improvement over the earlier black and white drawings and are entirely adequate for species identification.

In addition to the color plates, a unique and imaginative key is provided, with marginal sketches illustrating pertinent features. This key, prepared by Hugh Boyd, allows one to select any of seven categories (size, shape, bill shape, plumage color, bill color, voice or gross behavior) as a starting point for narrowing down the number of possible species, and one may quickly find the plate which illustrates the species in question. Unsuccessful users of this key are finally advised to consider the possibility of the unidentified bird being immature, in eclipse plumage, a mutant, hybrid, or descended from domestic stock, and are given hints for the recognition of such birds. A clear and concise account is given concerning the understanding and importance of scientific classification and Latin names. The plates are extremely well indexed, both by common and colloquial English as well as Latin names, the latter including currently used generic, specific and subspecific epithets, in addition to older names which are synonymized in the volume. These new features add greatly to the guide's value and usefulness. It is somewhat more pocket-sized (5½ by 8½ inches) than the earlier edition, the pages are of heavy stock, and the covers are of substantial cardboard.

A study of the plates will prove a rewarding pastime not only to the waterfowl enthusiast but also the student of avian evolution, who may readily perceive the magnitude of geographic variation (e.g., *Merganetta, Branta canadensis*), effects of insular isolation (*Anas acuta eatoni, Anas platyrhynchos laysanensis*), and remarkable intrageneric plumage diversity (*Anas, Mergus*) to be encountered in the family Anatidae.—Paul Johnsgard, *Department of Conservation, Cornell University, Ithaca, New York.*

The Behavioral, Ecological and Morphological Characteristics of Two Populations of the Alder Flycatcher, *Empidonax traillii* (Audubon).—Robert Stein. 1958. New York State Museum and Science Service, Bulletin Number 371, Albany, N. Y. 63 pp., 6 text figs. and photos. Distinct differences in song among the species of the genus *Empidonax* have long been considered the most practical means of field identification of this difficult group. In eastern North America each species has a single basic song pattern except the Alder Flycatcher (*E. traillii*) which has two song types, popularly referred to as "fee-bee-o" and "fitz-bew." Using objective analytical procedures, Kellogg and Stein (1953, Wilson Bulletin 65: 75–80) established the reality of the existence of these song types and suggested a constancy of each pattern over a large geographical area. The range of the "fee-bee-o" pattern is considered to be Canada and the northeastern United States while the "fitz-bew" pattern is restricted to the United States and especially west

of the Alleghany Mountains. In an effort to understand better the relationship between these unique segments of the Alder Flycatcher complex, Stein made an intensive three year field study of the two song-type populations in an area of sympatry near Ithaca, N. Y. His results appear in this well-edited New York State Museum Bulletin.

The two major contributions of this significant work are (1) the demonstration of population discrimination among the males, and its probable basis and (2) the analyses of morphological characters of two series of males of known song patterns. The behavioral response to the playback of recorded songs showed that males of each of the two song-types could recognize the difference between these song patterns, reacting positively to their own and negatively to the opposite pattern and to the songs of other *Empidonax*. The males, then, were behaving as distinct species in this respect.

Two series of 30–40 males of each song-type were compared with regard to morphological characters. The statistical analyses suggest that the two samples were probably taken from two populations, thus supporting the results of the playback experiments. There were slight, though significant, mean differences in length of tarsus, length of bill, and chord of wing. As might be expected, however, the nearly complete overlap of all linear measurements makes the identification of single specimens impossible on mensural criteria alone. Since Stein's analyses are based on the assumption of a normal curve distribution of his characters, one wonders whether possible bias may have been introduced by using a heterogeneous "fee-bee-o" sample, which included not only breeding individuals but also migrants in passage to more northerly areas. Comparisons of other aspects of the biology of these populations were less revealing: color and size of eggs, nesting chronology, habitat preference, structure and size of nest, and size of territory.

The consistent differences of voice, the "statistically significant" differences in morphological characters, and especially the negative response to the playback of the opposite song pattern led Stein to conclude that his study populations were reproductively isolated and represent distinct species. Unfortunately the above findings apply only to males. In a territorial species where the females have an active role in pair formation, any conclusion with regard to reproductive isolation is tenuous without some basis for distinguishing between the females of the supposed populations or for determining how females react to the different vocalizations of the males. This is offered not in deprecatory criticism of the study but to remind the reader of the tremendous complexity of the problem and the challenge that it offers to the student of field biology and experimental systematics. Stein is well aware of this complexity and is continuing his research. Knowledge of the status of the two song-types in other areas of sympatry, and especially information on the behavioral and morphological differences of the females mated to males of known song patterns will do much to strengthen his thesis.—W. E. LANYON.

The Breeding Biology of the Chimney Swift.—Richard B. Fischer. 1958. New York State Museum and Science Service, No. 368. 141 pp., 23 photographs, 6 graphs, 17 tables. In the course of the last 20 years there has been a steady increase in the number of birds subjected to an intensive study of breeding and related habits, with the result that far more is known in this important field than before. The Chimney Swift *(Chaetura pelagica)*, is the latest, and a worthy, addition to this list, and the present study covers all features of the nesting season

from the return in spring to the departure of the young. The similarities with, and the differences from, the two well-studied European species of *Apus* are of special interest. Annual mortality, apparently around 50%, is much higher than in *Apus*, and clutch-size is also much higher. Copulation was observed only at the nest, but I find it hard to believe that *Chaetura* should differ from *Apus* in not also doing so on the wing. The collection of twigs for the nest in the feet has no parallel in *Apus*, nor, so far as is known, has the remarkable habit, recorded by Dexter and here confirmed, that an extra bird may attach itself to a breeding pair and help to feed their young; in one case the third bird was a yearling raised by the parents in question in the previous year. The Chimney Swift regurgitates food for its young during the first week of their life, a habit apparently absent in *Apus*. 86% of the young flew successfully, and there was no variation with the weather, which is so marked a feature in *A. apus* in England (near the edge of its range). Fledgling Chimney Swifts, unlike *A. apus* but like *A. melba*, return to the nest for some days after their first flights outside. In other respects the life history is very similar to that established for the Old World species of *Apus*. The booklet is illustrated with excellent photographs of both parents and young. It is to be hoped that someone will now make comparable studies of *Cypseloides* and *Aeronautes* spp.—David Lack.

Revision und Entstehung der Arkischen Vogelfauna.—Hans Johansen. Pt. 1. Einfuhrung und Revision der Gaviae-Galli. 1956. Acta Arctica, 8: 1–98. Price, 30 Danish kr. Pt. 2. Revision der Grues-Passeres und Entstehung der Arktischen Vogelfauna. 1958. Acta Arctica, 9: 1–131. Price, 35 Danish kr. Societas Arctica Scandinavica, Zoological Museum, Copenhagen, Denmark. (In German; extensive English summary.) This "Revision and Origin of the Arctic Bird Fauna" treats all species breeding in the Arctic (defined as the area north of the polar tree-line) from the viewpoint of distribution, geographical origin, and phylogenetic relationship. For each species (or species group) considered truly Arctic a circumpolar map is provided, indicating the distribution of the various forms. The author's familiarity with the considerable Russian literature on Arctic birds, listed in the bibliography, makes this work of special value.

As a foundation to the systematic treatment, there is an elaborate preliminary discussion of the many drastic climatic and ecological fluctuations in the Arctic during Pleistocene and Recent times. Johansen points out that tundra-inhabiting species had their ranges restricted and broken up not only during the periods of glaciation, when much of the Arctic was covered with ice, but also during the height of the interglacial periods, when forest covered most of the present tundra and coastal areas were reduced by the rise in sea-level. The Recent "Atlantic Warm Period" (between 7,000–3,000 years ago), when the climate was warmer than today, also affected Arctic bird distribution. Speciation in the Arctic is considered to be largely the consequence of isolation in tundra refugia, both north and south of the glaciated areas, during the Pleistocene. In such refugia isolated populations developed differences, which, in many cases, resulted in a failure to interbreed freely when changed conditions enabled the allied populations to expand their ranges and meet again.

The treatment of the puzzling relations between the Herring Gull *(Larus argentatus)* and its allies *(thayeri, glaucoides, kumlieni)* in the American Arctic is interesting, though, of necessity, highly speculative. He suggests that *kumlieni* (southern Baffin Island) resulted from hybridization between *thayeri* and *glau-*

coides, though today the supposed parental stocks appear to be no longer in contact. His opinion that *L. a. smithsonianus* developed about the Bering Straits during the last ice age and later spread from west to east seems very questionable to this reviewer; the available facts indicate just the opposite. *Smithsonianus* is today primarily a form of the Atlantic watershed and its restricted range in the Pacific northwest and in the Arctic suggests a recent extension—similar to that of other expanding eastern American birds. The closest affinities are surely with the European nominate race, *argentatus*, from which the differentiation of *smithsonianus* is so slight that one or the other must have been derived from a relatively recent crossing of the Atlantic, possibly post-glacial. In assuming a Pacific derivation for the subspecies *smithsonianus*, Johansen may have been misled by a reference in the 1931 edition of the A.O.U. Check-list to a supposed Pleistocene record from Oregon of *L. argentatus*—which proves not even to be a *Larus* (Wetmore, Smith. Misc. Coll., 131, no. 5: 76, note 3, 1956).

Students will doubtless disagree with some of the phylogenetic speculations, but this does not detract from the usefulness of the distributional data and maps in this fine work.—E. Eisenmann.

Birds of Maryland and the District of Columbia.—Robert E. Stewart and Chandler S. Robbins. N. A. Fauna No. 62, Government Printing Office, Washington; pp. i-vi, 1–401, 1 pl., two general and 67 range maps. 1958. $1.75.—This is one of the best and most useful recent state books. Unpretentious in appearance, bound only in stiff wrappers, having no color plates and omitting the general information that can easily be found elsewhere, it provides in an adequate way the information really needed about the area covered. The species material is full of detail; the biotic regions are discussed at length; and a historical sketch and skeleton bibliography are included.

There are questions that can properly be raised. Considering the difference in type and quantity of past work in the two political areas covered, one wonders if it might not have been better to have limited the scope of the book to Maryland. Since the District of Columbia was included, the bibliography might well have been more complete. For the reviewer a more serious question concerns the ignoring of subspecies. The authors made this decision on what they consider good grounds, but it seems an unfortunate decision. There is probably no region in America from which so many specimens are available for subspecific comment. Further, there are certain species, such as the Blue-winged Teal and the Swamp Sparrow, for which the Maryland status cannot be discussed intelligently without such comment. For lack of it, the breeding map of the Swamp Sparrow is simply a puzzle. Still, the main thing to be said about this book is that it is an admirable contribution to regional ornithological literature, and one which will always be uesful.

The thing that will give the book permanent value and its wellnigh unique characteristic is the extent of its emphasis on quantitative population data. No other state book gives such a vast number of numerical counts. This will constitute its chief usefulness for both present and future workers in the area. There are breeding counts for various parts of Maryland for all breeding species (32 counts, for example, for the Red-eyed Vireo) and migration and winter counts for many other species. Another interesting feature is the amount of banding data presented.—J. J. Murray.

Listening in the Dark. Orientation by Sound in Bats and Men.—Donald R. Griffin. 1958. 413 pp., 16 photo. pts., 15 text figs. Yale Univ. Press., New Haven, Conn. $7.50. Here is a remarkably stimulating book. The main subject is bats, particularly how they use sound to find their way, and probably their prey, in the dark. By ingenious experiments Griffin and his associates determined that bats (except for a few large-eyed species) orient by uttering ultrasonic bursts of short clicks, whose echoes (generally inaudible to human ears) enable the bats to avoid obstacles and even to differentiate between objects. One chapter is devoted to echolocation by birds. This has been determined of the South American Guácharo or Oilbird *(Steatornis),* which nests in the Stygian blackness of deep caves, and may prove to be true of some of the Oriental Cave Swiftlets *(Collocalia)* —famous as the source of birds'-nest soup. The reviewer has often wondered why, with an abundance of nocturnal insects, there should be so few nocturnal birds. Griffin asks, rather, why there should be no diurnal bats. He suggests that the nocturnal habits of many flying insects may be an adaptation to escape birds and that bats evolved from nocturnal insectivores after birds, including raptors, had already developed from diurnal reptiles. Echolocation by blind persons is also treated.

This book is written in a style designed for the science-minded general reader, though supported by considerable detail as to the experiments—altogether an intellectual adventure.—E. EISENMANN.

Suplemento de Las Aves de Chile.—J. D. Goodall, A. W. Johnson, and R. A. Philippi B., with collaboration of Francisco Behn and Guillermo R. Millie. 1957. Suppl., pp. 349–425; 26 ills., 1 col. (Vol. 1 reprinted, including supplement, 441 pp., cloth or paper cover.) Obtainable from A. W. Johnson, c/o Katz Johnson, S. A. C., Casilla 327, Santiago, Chile.—The first volume of the useful handbook of Chilean birds (see reviews of the two volumes, Auk, **64:** 149, 1947; **70:** 505, 1953) has for some time been out of print. In reprinting it, the authors took the opportunity to include a supplement (available separately), with corrections, changes of nomenclature, and numerous additions, not only of species and subspecies previously unrecorded, *e.g.,* the northern *Vireo o. olivaceus,* but also a great deal of new information on other species, particularly the three flamingos. The following subspecies are described as new: *Phrygilus gayi minor* by Philippi and Goodall, and *Milvago chimango fuegensis* by Johnson and Behn. "Las Aves de Chile" remains the only modern descriptive work providing means for identification of the birds of any South American country. It is much more than an identification guide, for it attempts to summarize all available Chilean life history data on the species treated. The text is in simple Spanish, and the many illustrations add greatly to the usefulness of this work.—E. EISENMANN.

Ptitsy Sovetskoi Arktiki [Birds of the Soviet Arctic].—S. M. Uspenski. 1958. Academiya Nauk S.S.S.R. Naukno—popolyarnaya sereya (Popular science series), Moscow, 1958, 166 pp., 316 figs., other figs. (not numbered), 2 col. pls. Paper cover. Price, 3 roubles. (Sold by Am-Rus Literary and Music Agency, 24 West 45 St., New York, N. Y., at 50 cents.) (In Russian.) A handbook for the identification and study of birds found in Russian territory from the Arctic Circle northward. An introduction gives a brief account of different areas and biotopes, followed by the main work in which the species are listed in systematic order under a Russian name followed by the scientific name in parentheses. Treatment is by species with

no indication of subspecies. Each account includes a description of the bird with measurements, nesting (with egg measurements), call notes, some statement of habits, and an outline of range. Numerous black-and-white figures throughout, and two color plates of Scolopacidae, aid in identification. A chapter at the end gives a brief guide for field observations, and instruction for the preparation of study skins.—A. WETMORE.

Les Passereaux. III: Des Pouillots aux Moineaux.—Paul Géroudet. 1957. 287 pp., 48 pls., 32 in color, 38 drawings. Delachaux and Niestlé S. A., 4 Rue de l'Hôpital, Neuchâtel, Switzerland. 15 Swiss francs. This is the sixth and completing part of "La Vie des Oiseaux," the French handbook of birds, covering the avifauna of France, Switzerland and Belgium. This volume treats the *Phylloscopus* warblers to the sparrows. After stating the French and technical names (with English, German, and Italian names also indicated), there is a brief description of each species, followed by a general account of status, nesting, voice, migration, and behavior. In smaller type distribution of subspecies occurring within the area is given, occasionally with some taxonomic comment, and also references to recent important periodical literature. Compared with the "Handbook of British Birds," there is less distributional and morphological data, and the accounts are more discursive and popular in style. The information on behavior is, however, often fuller, with more modern data (literature up to 1957 is cited), although the lack of topical subheadings makes quick reference less easy. At the end of the volume, there is a section with additions to the data contained in the preceding five volumes. This is an authoritative work, which will be consulted frequently by those interested in the behavior of European birds. The drawings and colored plates by various artists often have a great deal of character; they are very different from the usual ornithological illustrations.—E. EISENMANN.

Nasi Pevci [Our Songbirds] Part 1.—Josef Jirsík. 1955. Science Ser., Biology Section, Československá Akademie Ved, Prague. 375 pp., 4 color plates, 50 figs., paper cover. (In Czech.) A full handbook for the local Corvidae, Sturnidae, Oriolidae, Fringillidae, Ploceidae, Alaudidae and Motacillidae. A six-page introduction gives briefly characters of the order, and other general data, taken in part from Stresemann's Aves. A diagnosis for family and genus is followed by an account of each species with common name and scientific name, to subspecies where required. A heading in smaller type cites local names in Czech, and gives a common name in Russian, Polish, English, French, German and Italian. This is followed by statements on range, description (including measurements), something on related subspecies and their distribution where pertinent, call notes, local occurrence, migration, food, and life history, including description of nest and eggs. Two maps illustrate returns for rooks and siskins ringed at several localities in Slovakia and Hungary, and another shows the distribution of the races of the Reed Bunting *Emberiza schoeniclus*. Figures illustrate characters of various forms. —A. WETMORE.

Nomina Avium Europaearum. Harriet I. Jørgensen. 1958. i-xi + 283 pp. (Ejnar Munksgaard, Copenhagen, Denmark). Price, Danish kr. 27. This is a greatly enlarged and improved revision of "Glossarium Avium Europaearum" (1941). It lists the scientific names of all European bird species, with their names in nineteen modern European languages, plus "North American" (if the species is in the A.O.U. Check-list). In addition, there are indexes in each language, which

include well-known vernacular synonyms for the names preferred in the text. A valuable novelty is the diagram of the topography of a bird showing the terms used for sixty characters in twenty-one languages (including North American). Finally there is a select bibliography, chiefly of recent European check-lists, field-guides, and regional handbooks. A very useful little book and a real contribution to international understanding.—E. EISENMANN.

Songs of Warblers of Eastern North America.—Recordings by Donald Borror and William Gunn, narration by Thom Benson. 33½ RPM vinylite record. Federation of Ontario Naturalists, 187 Highbourne Rd., Toronto. Price $5.95. This constitutes volume 4 of the Federation's "Sounds of Nature" Series. More than 400 songs are presented, representing all the species of warblers of eastern North America, with the exception of the elusive Bachman's Warbler. The arrangement of species on the record is according to similarities of phraseology and tempo, rather than to check-list order.

The technical difficulties associated with the recording and reproduction of bird voices are paramount where warblers are concerned. The recorders and publishers of this record are to be congratulated for handling their problems so well. A maximum portion of the disc playing time is devoted to the actual song recordings. Explanatory remarks have been wisely relegated to the record jacket. A commendable feature of scientific importance provided on the jacket is the inclusion of localities (state or province) and months of the recordings.—W. E. LANYON.

Lista de las Aves de Venezuela con su Distribución. Tomo II. Parte 2. No Passeriformes.—William H. Phelps and William H. Phelps, Jr. 1958. Bol. Soc. Venez. Ciencias Nat., 19 (90): 1–317, map. This scholarly volume, covering the non-passeriform birds, completes the Venezuelan check-list, the first volume (Parte 2. Passeriformes) of which appeared in 1950 (reviewed, Auk, **68**: 121–122, 1951). For each recognized form we are given original citation, distribution in Venezuela, a brief statement of habitat, and an indication of extra-limital range. A Spanish name (usually invented) is provided for each species. The amazing variety of the Venezuelan avifauna is compared tabularly with the even more opulent bird-life of Colombia and Brazil. But Venezuela is rich enough: 81 families, 612 genera, 1,282 species, 1,965 subspecies. (From a vastly greater area, with numerous bird students, the 1957 A.O.U. Check-list of North American Birds reports only 796 species, of which almost a hundred are either rare strays from abroad or introduced.) Seventeen non-passerine species are listed as known only from Venezuela. Several were discovered through the explorations of the authors, and that is true of a large number of additional subspecies. The main check-list is introduced by useful supplemental lists of migrants, of forms whose type locality is restricted in this work, of names synonymized, and of birds likely to occur but not yet recorded. An indication of the completeness of the Phelps collection is a list of only 35 non-passerines reported from Venezuela of which they possess no Venezuelan specimen. A map showing localities, a gazeteer, a bibliography, and an index conclude this fine work.

May we hope that the authors, with their unique knowledge of their country, will hereafter provide an acocunt of the zoogeography, which will help to explain, or at least throw light on, the distribution and speciation of Venezuelan birds.—E. EISENMANN.

RECENT LITERATURE

EDITED BY FRANK MCKINNEY

ANATOMY AND EMBRYOLOGY

BAUMEL, J. J. 1958. Variation in the brachial plexus of *Progne subis*. Acta anat., **34**: 1–34.—The results of bilateral dissections of 10 specimens. In general, variations were minor. Often as much variation was found between sides of the same individual as there was between different individuals.—F. M.

DINNENDAHL, L. and G. KRAMER. 1957. Uber grössenabhängige Änderungen von Körperproportionen bei Möwen (*Larus ridibundus, L. canus, L. argentatus, L. marinus*.). Journ. für Ornith., **98**: 282–312.—A statistical analysis of size-independent modifications of the body proportions of four species of gulls.—H. C. M.

ENLOW, D. H., and S. O. BROWN. 1958. A comparative histological study of fossil and recent bone tissues. Part II. Class Aves. Texas Journ. Sci., **9** (2): 206–214.—Details of structures, listed under generic name only, in *Dinornis*, and in one or more examples in 11 orders of living birds.

MALEWITZ, T. D., and M. L. CALHOUN. 1958. The gross and microscopic anatomy of the digestive tract, spleen, kidney, lungs, and heart of the turkey. Poultry Sci., **37**: 388–398.

NELSON, O. E. 1958. The development of the primitive streak and early chick embryo in relation to low O_2 pressure. Growth, **22**: 109–124.—Two levels of minimal O_2 requirement are found, a lower one for development and function of the primitive streak and a higher one for individuating rudiments.—P. H. B.

RIGDON, R. H., T. M. FERGUSON, G. L. FELDMAN, and J. R. COUCH. 1958. Air sacs in the turkey. Poultry Sci., **37**: 53–60.—A study employing injected latex. A single cervical or clavicular, a paired thoracic, and two paired abdominal air sacs are described.—P. H. B.

SCHMIDT, W. J. 1957. Schraubiger Faserverlauf in der Schalenhaut des Vogeleies. Journ. für Ornith., **98**: 432–440.—Structural evidence in the shell and egg membrane indicates that the egg rotates in its passage through the oviduct.—H. C. M.

STEINBACHER, J. 1958. Zur Anatomie der Diplopodie bei einem Vogel. Senck. Biol., **39** (1/2): 41–45. Frankfurt am Main, Germany. The anatomy of diplopodia in a jay (*Garrulus glandarius*).

BEHAVIOR

ANDREW, R. J. 1956. Begging responses of certain Buntings. Brit. Birds, **49**: 107–111.—The begging of young *Emberiza schoeniclus, E. canandra,* and *E. citrinella* and the development of fear responses are described.—F. M.

ARMSTRONG, E. A. 1956. The amateur and the study of bird display. Suggestions for further work. Brit. Birds, **49**: 97–106.

FRITH, H. J. 1957. Experiments on the control of temperature in the mound of the Mallee-fowl, *Leipoa ocellata* Gould (Megapodiidae). C.S.I.R.O. Wildlife Research, **2**: 101–110.—Artificially induced changes in the internal temperature of the incubator mound are detected and the bird alters its behavior to deal with them. It is suggested that the tongue is the organ involved in the perception of mound temperature.—F. M.

HOESCH, W. 1958. Uber das Zusammenwirken von Färbung und Verhalten.

Journ. für Ornith., **99**: 173–177.—An analysis of behavior in relation to plumage color and pattern. Based on field observations in southwest Africa.—H. C. M.

HURRELL, H. G. 1956. A Raven roost in Devon. Brit. Birds, **49**: 28–31.

KILHAM, L. 1958. Sealed-in winter stores of Red-headed Woodpeckers. Wilson Bull., **70**: 107–113.—Several individuals of *Melanerpes erythrocephalus* stored acorns and insects in crevices and cavities and closed the entrances by pounding in splinters of wood and pieces of bark.—J. T. T.

KORNOWSKI, G. 1957. Beiträge zur Ethologie des Blässhuhns *(Fulica atra L.)*. Journ. für Ornith., **98**: 318–355.—A contribution to the ethology of the Coot; results of a two year study in East Holstein.—H. C. M.

MUMFORD, R. E., and R. L. ZUSI. 1958. Notes on movements, territory, and habitat of wintering Saw-whet Owls. Wilson Bull., **70**: 188–191.—*Aegolius acadicus* in Michigan.—J. T. T.

NEWMAN, D. L. 1958. A nesting of the Acadian Flycatcher. Wilson Bull., **70**: 130–144.—Detailed observations from nest-building to feeding of fledglings of *Empidonax virescens*.—J. T. T.

ROLLIN, N. 1956. Song output of unstimulated Skylark [*Alauda arvensis*]. Brit. Birds, **49**: 218–221.

SAUER, F. 1957. Ein Beitrag zur Frage des "Einemsens" von Vögeln. Journ. für Ornith., **98**: 313–317.—Four hand-raised Garden Warblers *(Sylvia borin)* were experimentally subjected to ants and "anting" behavior observed. 16 photographs.—H. C. M.

STEWART, P. A. 1958. Locomotion of Wood Ducks. Wilson Bull., **70**: 184–187.—Data are presented on the swimming and running speeds of young and the flying speed of adult *Aix sponsa*.—J. T. T.

WEBER, H. 1958. Beobachtungen am Nest des Zwergschnäppers *(Muscicapa parva)*. Journ. für Ornith., **99**: 160–172.—Breeding biology and behavior of the Red-breasted Flycatcher. Enemy recognition was tested with models.—H. C. M.

WENDLAND, V. 1958. Einiges vom Verhalten der Nebelkrähe *(Corvus corone cornix)*. Journ. für Ornith., **99**: 203–208.—Notes on a winter roost of the Hooded Crow; and on this species' reactions to various raptors and martens.—H. C. M.

Diseases and Parasites

ARUNDEL, J. H. 1958. Perosis and folic acid antagonism in chickens. Nature, **181**: 342.

BAKER, J. R. 1958. Leucocytozoon spp. in some Hertfordshire birds. Nature, **181**: 205.—Five species found in 7 species of adult birds; none in nestling birds.

BARD, F. G. 1958. Botulism at Old Wives Lake. Blue Jay, **16**: 60.—Brief account of 46 dead birds on one-quarter mile of beach.

STAFSETH, H. J. 1958. Advances in knowledge of poultry diseases over the past fifty years. Poultry Sci., **37**: 741–775.—Covers bacterial, protozoan, viral, Rickettsial, and nutritional diseases and mycoses with reference to the fowl and to some extent game birds and waterfowl.—P. H. B.

Distribution and Annotated Lists

BULL., J. L. 1958. The birds of the New York City area. Amer. Mus. Nat. Hist., New York: 47 pp. Price 85 cents.—A briefly annotated list of all species collected or observed in New York City, and adjacent portions of southern New York, northern New Jersey, and southwestern Connecticut. Distribution

given only in general terms, with indication of preferred habitat of most breeding species. Terms used for relative abundance and frequency of occurrence are carefully defined. The area covered is shown on a double-page map. Subspecific indentifications given for some species, but not for all.—K. C. P.

DEMENTIEV, G. P., and N. A. GLADKOV. 1956. Notes on the avifauna of the Soviet Union with special reference to the new Russian Handbook. Brit. Birds, **49**: 272–278.—A brief account of the history of ornithology in Russia with remarks on the procedure followed in compiling "The Birds of the Soviet Union". A table lists the number of species in each family which are known to occur or breed in the U.S.S.R.—F. M.

DOHLE, W., H. D. JÜDE, and F. GOETHE. 1957. Blauschwanz, *Tarsiger cyanurus* (Pall.), auf Mellum. Journ. für Ornith., **98**: 119–121.—First record of the Red-flanked Bluetail for Germany.—H. C. M.

FYFE, R. W. 1958. Prairie Falcon nesting records in Saskatchewan. Blue Jay, **16**: 115–116.

GODFREY, W. E. 1958. Birds of Cape Breton Island, Nova Scotia. Canad. Field.-Nat., **72**: 7–27.

HÖHN, E. O. 1958. The supposed occurrence and nesting of the Slaty-backed Gull in the western arctic of Canada. Canad. Field.-Nat., **72**: 5–6.—Evidence that there is no valid record for Canada of this species.—R. W. N.

HOUSTON, C. S., F. G. BARD, and R. W. NERO. 1958. Further information on certain unusual Saskatchewan bird records. Blue Jay, **16**: 64–65.

JOHANSEN, H. 1957. Die Vogelfauna Westsibiriens III. Teil (Non-Passeres) 3. Fortsetzung: Aquilinae 1 *(Aquila-Circus)*. Journ. für Ornith., **98**: 262–278.—The birds of Western Siberia.—H. C. M.

JOHANSEN, H. 1957. Die Vogelfauna Westsibiriens. Journ. für Ornith., **98**: 397–415.—Birds of Western Siberia, Part III *(Accipiter-Aegypius)*.—H. C. M.

KEITH, K., and M. P. HINES. 1958. New and rare species of birds at Macquarie Island during 1956 and 1957. C.S.I.R.O. Wildlife Research, **3**: 50–53.

KOELERS, H. J. No date (1958). Beschermde en te beschermen vogels van de Benedenwindse Eilanden. (Protected and beneficial Birds of the Leeward Islands) 32 pp., ill. Published by Vereniging voor Dierenbescherming op de Nederlandse Antillen, Curaçao, N.W.I. Price, 1 Florin.—Brief popular accounts of 60 species, in the Dutch, Papiamento and English languages. 59 additional species known certainly to occur on Curaçao are listed under the scientific, Dutch and English (North American) names.

LAHRMAN, F. W. 1958. The Blue Goose in Saskatchewan. Blue Jay, **16**: 57–58.—Occurrence and distribution, mainly Regina vicinity.

MERIKALLIO, E. 1958. Finnish birds. Their distribution and numbers. Fauna Fennica, **5**: 1–181. Societas pro Fauna et Flora Fennica, Helsinki. A detailed distributional list. The estimated number of breeding pairs is given for each species, with 131 distributional maps showing relative abundance in different parts of the country. The quantitative data, based largely on line surveys made throughout the country from 1941-1956, are surely unrivalled for an area as large as Finland. 327 species are listed; the total number of breeding pairs is estimated to be 32,160,000.—E. E.

MOREAU, R. E. 1956. Quail in the British Isles, 1950-53. Brit. Birds, **49**: 161–166.—Summary of records of *Coturnix coturnix* with a discussion of distribution and fluctuations.—F. M.

MORLEY, A., and K. L. H. PRICE. 1956. The Black-tailed Godwit in Great Britain

and Ireland, 1938-1952. Brit. Birds, **49**: 258–267.—Documents the spectacular increase in *Limosa limosa*.—F. M.

MURRAY, L. H. 1958. The Black Duck in Saskatchewan. Blue Jay, **16**: 109–111.—General review of Black Duck range extension, especially in Canada.

PEITZMEIER, J. 1957. Zur Ausbreitung und Oekologie der Türkentaube *(Streptopelia decaocto)* in Westfalen. Journ. für Ornith., **98**: 441–444.—Extensions of range of the Collared Turtle Dove into Westphalia.—H. C. M.

PORTENKO, L. A. 1958. Die zoogeographische Erforschung Nordost-Asiens. Journ. für Ornith., **99**: 192–202.—The zoogeography of North-east Asia. A summary and classification.—H. C. M.

RAPP, W. F., JR., J. L. C. RAPP, H. E. BAUMGARTEN and R. A. MOSER. 1958. Revised Check-list of Nebraska Birds. Occ. Pap. Nebraska Orn. Union, No. **5**: i-viii + 1–35 + index. Nebraska Ornithologists' Union, 430 Ivy Ave., Crete, Nebr. $1.00. This is a briefly annotated list giving local distribution and status in a summarized fashion, mentioning also the subspecies that have been recorded. Nebraska is a particularly interesting area as the meeting ground for several eastern and western representatives whose status as species is in dispute.—E. E.

STRESEMANN, E. 1957. Eine Ornithologische Studienfahrt in den Parco Nazionale d'Abruzzo. Journ. für Ornith., **98**: 1–21.—An account of an ornithological excursion to an Italian national park in the mountains near Rome.—H. C. M.

STRESEMANN, E. 1957. Ein ornithologischer Streifzug durch Calabrien. Journ. für Ornith., **98**: 372–388.—Account of a trip through Calabria (South Italy), with a list of breeding birds.—H. C. M.

SNYDER, L. L. 1957. Changes in the avifauna of Ontario. In, Changes in the Fauna of Ontario, pp. 26–42. Royal Ontario Museum, Univ. of Toronto Press.—The other papers in this publication deal with factors influencing the changing fauna of Ontario, changes in the Insect, Amphibian and Reptilian, Fish, and Mammal fauna, and changes in Climate. Changes in the avifauna are classified under the headings "Extirpations" (2 species), "Range shrinkages and fluctuations" (6 species), "Introduced Exotics" (4 species) and "Range expansions" (23 species). Most, if not all, changes in the first three categories can be related to the works of man. Of the range expansions, 2 have been to the West, 7 to the East, and 15 to the North.—F. M.

STEINBACHER, J. 1958. Weitere Beiträge zur Vogelfauna von El Salvador. Senck. Biol., **39** (1/2): 11–40. Notes on a collection of birds from El Salvador. *Dives dives* is new to that country, and several others are interesting because of supposed rarity, molt condition, or date of northern migrants.—E. E.

TUCK, L. M. 1958. Present distribution and population of the Starling in Newfoundland. Canad. Field.-Nat., **72**: 139–144.

ECOLOGY AND POPULATION

BELCHER, M. 1958. Bird notes from a farm shelterbelt. Blue Jay, **16**: 101–104.—Species established in a shelterbelt in the prairie in south-central Saskatchewan.

COX, G. W. 1958. A comparison of wintering bird populations in three open field types in central Ohio. Ohio Journ. Sci., **58**: 189–193.—Disked corn stubble, undisturbed corn stubble, and soybean stubble were censused.

CRONAN, J. M. 1958. Sex ratios of wintering scaups in Long Island Sound. Wilson Bull., **70**: 191–192.—Data mostly on Greater Scaup *(Aythya marila)*

show a preponderance of males; in about 9600 field identifications, the ratio approximated 140 males per 100 females.—J. T. T.

GATES, J. M., and J. R. BEER. 1956. A marsh bird study—Spring 1955. Flicker, **28**: 16–21.—Notes on phenology on spring migration, territorial behavior and nesting for waterfowl and other marsh birds of a small marsh north of St. Paul, Minn.—F. M.

GODFREY, W. E. 1958. (Editor) Christmas bird census—1957. Canad. Field.-Nat., **72**: 32–47.—Summary reports across Canada.

HOESCH, W. 1957. Uber die Auswirkungen der Besiedlung auf den Vogelbestand in Südwest Afrika. Journ. für Ornith., **98**: 279–281.—Some observations on how bird populations are affected by human settlement in southwest Africa.—H. C. M.

LOUND, M., and R. LOUND. 1958. The 1957 Christmas bird count. Passenger Pigeon, **20**: 9–20.

MATHESON, C. 1956. Fluctuations in Partridge populations. Brit. Birds, **49**: 112–114.—Records of total bags of *Perdix perdix* on estates in Norfolk (years 1847-73) and Cardiganshire (1832-69).—F. M.

QUAY, T. L. 1957. The Savannah Sparrow *(Passerculus sandwichensis* Gmelin) in winter in the Lower Piedmont of North Carolina. Journ. Elisha Mitchell Sci. Soc., **73** (2): 378–388. Habitats, population densities, food, social behavior, responses to abnormal weather, and daily activity cycles.—E. E.

ROY, R. 1958. Resident longspurs in Lucky Lake area. Blue Jay, **16**: 56–57.—General population changes in McCown's and Chestnut-collared Longspurs in Saskatchewan.—R. W. N.

SNOW, D. W. 1956. The annual mortality of the Blue Tit in different parts of its range. Brit. Birds, **49**: 174–177.—"The annual mortality of the Blue Tit [*Parus caeruleus*] is estimated by the proportion of first-year to adult birds in museum specimens collected in the breeding season. In the British population the annual mortality of adults appears to be about 70%. The figures indicate that the mortality of juveniles is higher than that of adults in October and November, but from December onwards juvenile and adult mortality are about equal. Annual mortality of adults in different parts of the range is correlated with clutch-size."

UDAGAWA, T. 1957. On the population changes of birds before and behind the opening day for hunting season. Misc. Rept., Yamashima Inst. Orn. and Zool., No. **11**: 32–34. After the hunting season began certain small non-game birds showed a decrease in the area, notably the Japanese Jay *(Garrulus glandarius japonicus)* and the Brown-eared Bulbul *(Microcelis a. amaurotis)*—probably frightened by gun noise. (In Japanese; English summary.)

EVOLUTION AND GENETICS

ASMUNDSON, V. S., and F. W. LORENZ. 1957. Hybrids of Ring-necked pheasants, turkeys, and domestic fowl. Poultry Sci., **36**: 1323–1334.

WARREN, D. C. 1958. A half century of advances in the genetics and breeding improvement of poultry. Poultry Sci., **37**: 3–20.—Of interest to ornithologists is the survey of development of the genetics of birds, as represented by the fowl, from 1908 on. Morphological and plumage color traits, sex-linkage and sex identification, viability, population genetics and others are treated, with extensive bibliography.—P. H. B.

General Biology

Betts, M. M. 1956. Further experiments with an artificial nestling gape. Brit. Birds, **49**: 213–215.—An artificial nestling gape was used to collect samples of food from the parent as it perches outside the nest-box. The same model gape was used by Great Tits, Coal Tits, Blue Tits and Wrens. Food samples collected at nests in pine woods confirmed that there are differences in the foods brought by Great, Blue and Coal Tits.—F. M.

Browne, K. and E. 1956. An analysis of the weights of birds trapped on Skokholm. Brit. Birds, **49**: 241–257.—During 1947–53 over 4,000 birds of 69 species were weighed. The weight range and average weights for each species are given. Reasons for the great variability in weights are discussed. Spring migrants weigh less than birds on autumn passage. Fluctuations in weight of residents and diurnal variations were studied.—F. M.

Eaton, S. W. 1957. A life history study of *Seiurus noveboracensis* (with notes on *Seiurus aurocapillus* and the species of *Seiurus* compared). Science Studies, **19**: 7–36. Centennial Celebration Issue. St. Bonaventure Univ., St. Bonaventure, N.Y. Eaton studied the three species of *Seiurus* about Ithaca, New York, and as wintering birds in Cuba. Comparison of singing and nesting behavior.—E. E.

Gates, J. M. 1957. Autumn food habits of the Gadwall in northern Utah. Utah Academy Proc., **34**: 69–71.—Results of analysis of 199 stomachs. Only 6 of these contained ingested lead shot.—F. M.

Grosskopf, C. 1957. Das Durchschnittalter der auf Wangerooge nistenden Küstenseeschwalben *(Sterna macrura)*. Journ. für Ornith., **98**: 65–70.—Arctic Terns have been banded on the Baltic isle of Wangerooge since 1935. In the summers of 1955 and 1956 an effort was made to trap banded birds. Average age of recaptures banded as young was about 12 years; those banded as adults 6.5 years plus.—H. C. M.

Haverschmidt, F. 1957. Nachbarschaft von Vogelnestern und Wespennestern in Surinam. Journ. für Ornith., **98**: 389–396.—Observations on several species of birds which habitually nest in the vicinity of wasp's nests.—H. C. M.

Heinrich, G. 1958. Zur Verbreitung und Lebensweise der Vögel von Angola. Journ. für Ornith., **99**: 121–141.—A contribution to the Biology of the birds of Angola, West Africa. Introduction by E. Streseman. Account of the expedition, ecological notes, observations on mixed flocking, climate and breeding cycle; and on duet singing in some species.—H. C. M.

Hohlt, H. 1957. Studien an einer süddeutschen Population der Wacholderdrossel *(Turdus pilaris)*. Journ. für Ornith., **98**: 71–118.—Life history and breeding biology of the Fieldfare.—H. C. M.

Howard, W. E. 1958. Food intake and pellet formation of a Horned Owl. Wilson Bull., **70**: 145–150.—A captive *Bubo virginianus* was fed for four months and a complete record is presented of the items fed, amount eaten, and number and dry-weight of pellets formed.—J. T. T.

Klopman, R. B. 1958. The nesting of the Canada Goose at Dog Lake, Manitoba. Wilson Bull., **70**: 168–183.—*Branta canadensis interior* nesting dates, density, location, success, etc.—J. T. T.

Löhrl, H., and R. Böhringer. 1957. Untersuchungen an einer südwestdeutchen Population des Haussperlings *(Passer d. domesticus)*. Journ. für Ornith., **98**: 229–240.—8112 House sparrows were collected by poisoning; weights and measure-

ments were taken. 50.3% were males, 49.7% females. Out of 1440 birds collected in November and December 32.8% were adults. November adults were slightly heavier and had longer wing chords than juvenals. Sparrows collected near Würtenberg were heavier than those collected near Stuttgart.—H. C. M.

McEwen, E. H. 1958. Observations on the Lesser Snow Goose nesting grounds, Egg River, Banks Island. Canad. Field-Nat., **72**: 122–127.

Mauersberger, G. 1957. Umsiedlungsversuche am Trauerschnäpper *(Muscicapa hypoleuca)* durchgeführt in der Sowjetunion.—Ein Sammelreferat. Journ. für Ornith., **98**: 445–447.—A summary of several Russian papers on the transplanting of Pied Flycatchers.—H. C. M.

Norris, R. A., and D. W. Johnston. 1958. Weights and weight variations in summer birds from Georgia and South Carolina. Wilson Bull., **70**: 114–129.—Statistical data are presented on weights of 576 specimens representing 97 species, classified to sex and maturity. Some of the groups are compared and tested for significant differences.—J. T. T.

Peakall, D. B. 1956. Some notes on the Red-spotted Bluethroat. Brit. Birds, **49**: 135–139.—Observations on nest sites, nest building, incubation, and feeding the young in *Cyanosylvia s. svecica* made in Swedish Lapland.—F. M.

Portenko, L. A. 1957. Studien an einigen seltenen Limicolen aus dem nördlichen und östlichen Sibirien I. Journ. für Ornith., **98**: 454–466.—Life history of the Spoon-billed Sandpiper (*Eurynorhynchus pygmaeus* L.).—H. C. M.

Takashima, H. 1957. Notes on the Black Stork in Japan. Misc. Rep. Yamashina Inst. Orn. and Zool., No. **11**: 5–9. The status of *Ciconia nigra*. (In Japanese; English summary.)

Tutt, H. R. 1956. Nest-sanitation and fledging of the Green Woodpecker [*Picus viridis*]. Brit. Birds, **49**: 32–36.

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Young, H. 1958. The robin's year. Passenger Pigeon, **20**: 51–57.—Popular life history review.

Management and Conservation

Axell, H. E. 1956. Predation and protection at Dungeness Bird Reserve. Brit. Birds, **49**: 193–212.—During the 1939–45 war, gull and tern colonies were seriously depleted by human interference and high populations of bird and mammal predators. Efforts to restore the colonies by control of crows and foxes and the erection of fences around nests to prevent predation by Hedgehogs met with some success—F. M.

Newcombe, F. L. 1958. The conservation of waterbirds and their habitat in New Zealand. N. Z. Dept. of Internal Affairs, Wildlife Publ. No. 52.—A review of the present situation concerning waterbirds, their hunting and habitat requirements. Drainage programs threaten to destroy valuable waterbird habitats.—F. M.

Migration and Orientation

Allen, R. H., and G. Rutter. 1956. The moult-migration of the Shelduck from Cheshire in 1955. Brit. Birds, **49**: 221–226.—Observations on flocks of adult

Tadorna tadorna leaving the area of the Mersey and Dee on their migration across England. Evening watches during July in the years 1950–55 showed that 1,500–2,000 birds leave the area. The flocks fly to the east over a 10–12 mile wide belt, less than 10 miles south of Manchester. No migration occurs if the wind is from the east or south-east; strong north-west winds make the birds take a more southerly route.—F. M.

BARNES, J. A. G. 1956. Delayed emigration of certain birds in autumn 1954. Brit. Birds, **49**: 74–79, 167–171.

BARRAUD, E. M. 1956. The Crossbill invasion of Great Britain in 1953. Brit. Birds, **49**: 289–297.—Documents the irruption of *Loxia curvirostra* from Sweden in June-September.—F. M.

BECKIE, P. L. 1958. Observations of longspurs at Bladworth. Blue Jay, **16**: 55–56.—Migration data on McCown's, Lapland, and Chestunt-collared Longspurs in Saskatchewan.

CARRICK, R., N. KEITH, and K. KEITH. 1957. Third annual report of the Australian bird-banding scheme, July 1956 to June 1957. C.S.I.R.O. Wildlife Research, **2**: 145–163.—12,552 birds of 69 species were banded. Full data for 71 recoveries are given.—F. M.

CARRICK, R., W. R. WHEELER, and M. D. MURRAY. 1957. Seasonal dispersal and mortality in the Silver Gull, *Larus novae-hollandiae* Stephens, and Crested Tern, *Sterna bergii* Lichtenstein, in Australia. C.S.I.R.O. Wildlife Research, **2**: 116–144.—The results of the first cooperative banding project organized by the Australian Bird-banding Scheme since it began to operate in 1953.—F. M.

DILLON, S. T. 1956–57. A nine-year study of fall waterfowl migration on University Bay, Madison, Wisconsin. Wisc. Acad. Sci., Arts and Letters, **45**: 31–57, **46**: 1–30.—An analysis of counts made from late September to about mid-December in the years 1946 to 1954. 23 species of waterfowl are recorded for the area; 11 of these are considered common. Fluctuations in fall populations are discussed in relation to weather conditions and available food. The area is evaluated as a waterfowl refuge.—F. M.

HANTGE, E., and K. SCHMIDT-KOENIG. 1958. Vom Herbstzug des Steinschmätzers *(Oenanthe oenanthe L.)* auf Wangerooge und Langeoog. Journ. für Ornith., **99**: 142–159.—3,400 Wheatears were observed and 547 were trapped in the autumn migrations of 1951–54 on the Baltic islets of Wangerooge and Langeoog.—H. C. M.

HITCHCOCK, W. B., and R. CARRICK. 1958. First report of banded birds migrating between Australia and other parts of the world. C.S.I.R.O. Wildlife Research, **3**: 54–70.—Reviews migratory status of Australian birds. The results of banding are analysed in maps and tables. At least 87 of the 650 Australian species leave the country; most of these are sea-birds and shore-birds.—F. M.

KEMPER, C. A. 1958. Destruction at the T.V. tower. Passenger Pigeon, **20**: 3–9.—An account of three major disasters. On one night an estimated 20,000 birds were killed.—R. W. N.

KRAMER, G., J. G. PRATT, and U.v. ST. PAUL. 1958. Neue Untersuchungen über den "Richtungseffekt". Journ. für Ornith., **99**: 178–191.—A further investigation into the directional differences in homing performance of pigeons. The "directional effect" persisted at distances of 8 to 200 km and also under overcast skies. The results are taken to indicate that these observed differences are not due to differential ability to orient as to compass direction but that

the ability of determining the location of home (locating on a "map") is different for the various directions from the home loft.—H. C. M.

KURODA, N. 1957. A brief note on the pelagic migration of the Tubinares. Misc. Rep. Yamashima Inst. Orn. and Zool., No. **11**: 10–23.—Migration routes of various species of Procellariiformes, with a number of interesting banding recoveries. (In English.)—E. E.

NISBET, I. C. T. 1956. Records of Wood Sandpipers in Britain in the autumn of 1952. Brit. Birds, **49**: 49–62.—An analysis of a heavy passage of *Tringa glareola* in Great Britain.—F. M.

NISBET, I. C. T., and A. E. VINE. 1956. Migration of Little Stints, Curlew Sandpipers and Ruffs through Great Britain in the autumn of 1953. Brit. Birds, **49**: 121–134.—Analysis of records of *Calidris minuta, C. testacea,* and *Philomachus pugnax* in relation to weather conditions.—F. M.

SAUER, F. 1957. Die Sternenorientierung nächtlich ziehender Grasmücken (*Sylvia atricapilla, borin* und *curruca*). Zeitsch. für Tierpsychol., **14** (1): 29–71. This paper, "The stellar orientation of nocturnal migrant warblers", presents the data on a remarkable series of experiments. Inexperienced migratory Palearctic warblers of three species were placed a) out-of-doors in circular rotating cages so covered as to permit only an upward outlook of about 68° (to prevent orientation based on land-marks), and b) under artificial starry skies of a planetarium. During the normal period of autumnal migration these birds fluttered towards their natural migratory direction, whether out-of-doors on starry nights or in a planetarium showing the constellations appropriate to their time and location. A Lesser Whitethroat presented with an artificial sky as would appear at the latitude of the southern Mediterranean, changed the direction of its movement from SE to S, in the same way as these birds are known to change their course when reaching the eastern end of the Mediterranean. Sauer concludes that these species "possess a mechanism of migration orientation which enables them, independent of local topography and of their individual experience, to determine, with the help of their ability to assess time, their specific course of migration while steering by the starlit sky." (In German; English summary.)—E. E.

SAUER, E. G. F. 1958. Celestial navigation by birds. Sci. Amer., **199**: 42–47. A clear popular summary of Sauer's experiments with various Old World warblers, which are interpreted as showing that these nocturnal migrants orient by means of constellation patterns.

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THOMSON, A. L. 1956. The migrations of British Chats (*Oenanthe, Saxicola, Phoenicurus*) as shown by the results of ringing. Brit. Birds, **49**: 63–73.

WILLIAMSON, K., and P. DAVIS. 1956. The autumn 1953 invasion of Lapland Buntings and its source. Brit. Birds, **49**: 6–25.—An analysis of the big

invasion of *Calcarius lapponicus* into Britain in September 1953. Study of weather patterns suggests that most of these birds came from Greenland by means of down-wind drift. Taxonomic study indicates a two-way cline of decreasing bill-size and paler coloration eastwards and probably also westwards from Greenland. The species was unusually abundant in the United States in winter 1953–54 and the Nearctic population must have reached an optimum in autumn 1953.—F. M.

Physiology

George, J. C., and R. M. Naik. 1958. Relative distribution and chemical nature of the fuel store of the two types of fibres in the pectoralis major muscle of the pigeon. Nature, **181**: 709–711.—Narrow fibers are fat-loaded and broad fibers are glycogen-loaded; former adapted for sustained flight, latter for quick action.—H. C. S.

George, J. C., and R. M. Naik. 1958. Relative distribution of the mitochondria in the two types of fibres in the pectoralis major muscle of the pigeon. Nature, **181**: 782–83.—Most numerous in narrow fibers and sparse in broad.

George, J. C., and K. S. Scaria. 1958. Histochemical demonstration of lipase activity in the pectoralis major muscle of the pigeon. Nature, **181**: 783.—Lipase occurs mostly in narrow fibers.

Kirkman, H., and G. T. Kirkman. 1958. A nail found within a hen's egg. Nature, **181**: 1159–60.

Layne, D. S., R. H. Common, W. A. Maw, and R. M. Fraps. 1958. Presence of oestrone, oestradiol, and oestriol in extracts of ovaries of laying hens. Nature, **181**: 351–52.

Love, D. S., and I. R. Konigsberg. 1958. Enhanced desoxyribonucleic acid accumulation and retarded protein accumulation in skeletal muscle of "hypophysectomized" chick embryos. Endocrin., **62**: 378–384.

Pincus, G., and T. F. Hopkins. 1958. The effects of various estrogens and steroid substances on sex differentiation in the fowl. Endocrin., **62**: 112–118.

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Rautenberg, W. 1957. Vergleichende Untersuchungen über den Energiehaushalt des Bergfinken *(Fringilla montifringilla L.)* und des Haussperlings *(Passer domesticus L.)*. Journ. für Ornith., **98**: 36–64.—Results of a 1½ year comparative study of the energetics of the Brambling and House Sparrow. Weight, gas exchange, and metabolism were measured at regular intervals.—H. C. M.

Schmidt-Nielsen, K., and W. J. L. Sladen. 1958. Nasal salt secretion in the Humboldt penguin. Nature, **181**: 1217–18.

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Taber, E., M. Claytor, J. Knight, D. Gambrell, J. Flowers, and C. Ayers. 1958. Ovarian stimulation in the immature fowl by desiccated avian pituitaries. Endocrin., **62**: 84–89.—Supports hypothesis that mammalian and avian pituitaries differ qualitatively.

Vendrely, R., A. Knobloch, and H. Matsudaira. 1958. A comparative biochemical study of nucleohistones from different vertebrates. Nature, **181**: 343.—Includes the fowl and the duck.

Völker, O. 1958. Die Rotfärbung der Flamingos *(Phoenicopterus)* im Freileben

und in der Gefangenschaft. Journ. für Ornith., **99**: 209–217.—An analysis of the feather pigments of flamingos shows that they consist of red caretenoids which are not closely related to Astaxanthin or other plant or animal caretenoids. The diet of free living flamingos and some experimental diets for captives are discussed.—H. C. M.

Taxonomy and Palaeontology

Bond, G. M. 1957. Notes on the taxonomy of Maryland birds. Part I—Non-Passeres. Md. Nat., **27**: 2–5.—Comments on the taxonomy of the Canada Goose, Snow Goose, Blue-winged Teal, Screech Owl, and various picids.

Davis, L. I. 1958. Acoustic evidence of relationship in North American crows. Wilson Bull., **70**: 151–167.—Audio-spectrographic analyses of the calls of six species of *Corvus*. *Corvus sinaloae* sp. nov. (Escunapa, Sinaloa, Mexico) is separated from *C. imparatus* Peters by wing-tail ratio and the voice.—J. T. T.

Mayr, E. 1956. The interpretation of variation among the Yellow Wagtails. British Birds, **49**: 115–119. Doubts Williamson's theory that migrational drift and drag sufficiently explain the similarity and variability of widely separated populations of the *Motacilla flava* complex, and suggests questions for field study bearing on the existence of reproductive isolation between forms.

Mayr, E. 1957. New Species of birds described from 1941 to 1955. Journ. für Ornith., **98**: 22–35.—An evaluation. (In English.)—H. C. M.

Nicolai, V. 1957. Die systematische Stellung des Zitronenzeisigs *(Carduelis citrinella* L.). Journ. für Ornith., **98**: 363–371.—A comparison of song, feeding habits, and general behavior between *C. citrinella* and palearctic, ethiopian, and neotropical Carduelines showed that it is not closely related to *Spinus* or *Acanthis* but instead more closely to *Serinus*.—H. C. M.

Niethammer, G. 1957. Die hellen Vogelrassen des Etoscha-Gebietes (SW-Afrika). Journ. für Ornith., **98**: 448–453.—7, or perhaps 12 light races of birds were found in S.W. Africa. A new subsp. *Anthus richardi grotei* is described.—H. C. M.

Rand, A. L. 1958. Notes on African Bulbuls. Family Pycnonotidae: Class Aves. Fieldiana, Zool., **35**, No. 6: 145–220.—Notes compiled during the preparation of a list of African Bulbuls for the forthcoming volume of Peter's Check-list. The genera *Neolestes* and *Tylas* are included in the family; *Suaheliornis* and *Lioptilornis* are excluded, the former being considered a Sylvid near *Macrosphenus*, and the latter a Timaliid. Thirteen genera and sixty species are recognized.—M. A. T.

Vaurie, C. 1958. Systematic notes on Palearctic birds. No. 33. A second review of *Carpodacus puniceus*, with a study of its plumages, and a supplementary note on *Emberiza schoeniclus*. Amer. Mus. Novitates, **1898**: 10 pp.—Reexamination of these two species, previously discussed by Vaurie, based on study of specimens in European museums. *C. p. szetschuanus* is now synonymized with *C. p. longirostris*. Lack of adequate molting material prevents full understanding of plumage sequence in this species; yellow-rumped individuals are postulated to be two years old, but such birds are not known from some populations. *E. s. reiseri*, formerly synonymized with *E. s. intermedia* by Vaurie, is resurrected as a valid race.—K. C. P.

Williamson, K. 1955. Migrational drift and the Yellow Wagtail complex. British Birds, **48**: 382–403. The *Motacilla flava* complex is interesting as a group undergoing extensive speciation. Most "Yellow Wagtails" have dark

heads, but in Great Britain and in two widely separated parts of Asia breeding yellow-headed populations seem to be overlapped in part by dark-headed populations. Apparent hybrids and birds similar in appearance to those usual in other areas occur in Britain and elsewhere. The prevailing view has been that most aberrant specimens were "mutants" of the local populations, merely "convergent" in appearance with other subspecies. Williamson believes that the yellow-headed birds should be regarded as a species, *M. lutea*, that the birds resembling extra-limital forms are not mutants but actually members of those subspecies, which have been carried off their course by prevailing winds ("migrational drift"). The propensity of wagtails to form multi-racial flocks, especially when they have drifted outside their racially-specific migration routes, causes them to be carried along with the migrants appropriate to the area ("migrational drag"), and even to breed outside their normal range.—M. T. M.

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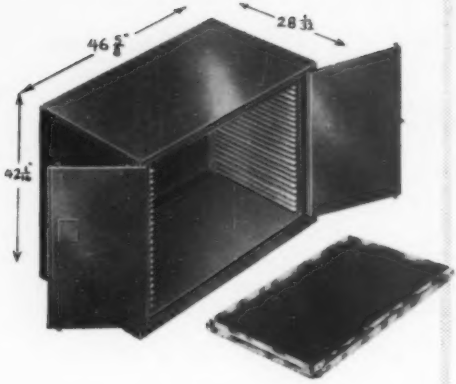

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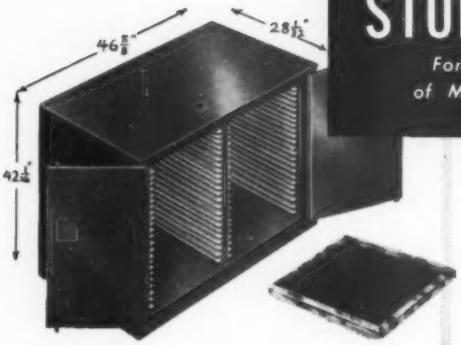

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